Working DRAFT
3/25/97

EDUCATION/NSF WORKING GROUP
Timeline for Development of Action Plan

	March 15 - April 15	April 15 - May 1	May 1 - May 15	May 15 - June 1
Complete Baseline				
by March 24: • Federal programs • Other Federal activities				
by March 31: • Test design • Environment				
by April 4: • Input from stakeholders				
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by April 25: • actions based on existing programs with clear potential for impact by 99 ready for public release				
Outline of Action Plan				
by April 25: • outline of major areas for action in each of the four framework areas				
by May 2: • ~~tentative staging~~ of those actions with assignment of responsibility • suggested actions outside the four framework areas as needed				
Consultation				
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Draft Action Plan				
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Agency, OSTP, DPC Concurrence				
• complete by May 31				
Submit to President by June 3				

Working Group on Improving Mathematics Education--Area #1: Teaching

1. What's already been done?

The Teacher Enhancement (TE) program in NSF's Division of Elementary, Secondary, and Informal Education (ESIE) has supported a large number of professional development projects to broaden and deepen the disciplinary and pedagogical knowledge of K-12 teachers in mathematics. At present, there are over a hundred active, multi-year mathematics projects in TE. These awards range from planning grants (under $ 50,000) to very large scale efforts (over $ 5 million). To ensure sustained professional development for ALL mathematics teachers in the targeted schools/districts and clear linkages with the classroom use of high quality instructional materials in mathematics, the first of ESIE's Local Systemic Change (LSC) projects for grades K-8 was funded in FY 94 within TE. This was soon followed by the Local Systemic Change projects for secondary mathematics in FY 96. To date, 13 LSC projects in mathematics have been funded through the TE program.

NSF's Division of Educational Systemic Reform has funded 15 State Systemic Initiatives (SSI), 20 Urban Systemic Initiatives (USI), and four Rural Systemic Initiatives (RSI). To varying degrees, each of these large-scale projects provides professional development in support of the vision of teaching/learning promoted by the NCTM's Standards. NSF's Collaboratives for Excellence in Teacher Preparation (CETP), funded by the Division of Undergraduate Education, have supported improved preparation of future K-12 teachers of mathematics.

The Department of Education (ED) makes funding for professional development in mathematics and science available to every State and local educational agency in the Nation through the Eisenhower Professional Development Program, currently funded at over $300 million per year. Programs, which vary widely in scope, depth, and approach, operate at three levels--those sponsored by the State education agency, those operated by institutions of higher education or non-profits as a result of statewide competition, and those operated by local education agencies.

ED funds ten regional Mathematics and Science Consortia throughout the Nation. Central among their objectives is the commitment to developing the professional skills of today's mathematics and science teachers. The Consortia provide a rich variety of support to teachers including electronic networks, training trainers, and brokering the professional development offerings of others. Services also include coordination with the resources of the Eisenhower National Clearinghouse, another ED-funded project, which provides access to a mathematics and science resources for teachers--particularly valuable to those who are seeking new ways to teach.

ED also funds fifteen Comprehensive Centers, many of which have a professional development expert on staff to advise state and local educational agencies on improving teaching, including the teaching of mathematics.

2. What is working?

Project-specific evaluation data document numerous successes in each of the NSF program areas cited above: quality programs of professional development for teachers, increases in student achievement scores, adoption/implementation of standards-based instructional materials, and improved course-taking patterns in mathematics by students, including those who have been traditionally underrepresented. Many NSF projects afford opportunities for multi-year professional development.

In the NSF program areas cited above, there is evidence of effective partnerships involving school districts, higher education, and others (e.g., businesses and industry, teacher unions, etc.). These

partners make significant cost-sharing contributions to the projects: in LSC projects, for example, it is not uncommon for cost-sharing commitments from partners, especially school districts, to actually exceed the amount of the NSF award. Such high percentages of cost-sharing are visible signs of strong programmatic and financial commitment from districts and other partners.

In the Eisenhower state and local program, there is a trend toward more sustained professional development efforts, consistent with State education reform efforts and with emphasis on giving teachers skills that are transferable to the classroom. Since States are now required to develop and report on performance indicators, many are gearing their efforts toward strategies that are expected to yield increases in scores on mathematics assessments. Most projects funded by the higher education component of the program provide evaluation data to show their effectiveness.

3. Gaps?

At present, sufficient capacity/infrastructure to deliver long-term, high quality professional development for all the nation's teachers of K-12 mathematics is lacking. Qualified professional developers with the necessary combinations of expertise/experience in disciplinary content, pedagogical expertise, assessment, technology, etc.. are in short supply, relative to the need. Districts frequently have to commit valuable resources to "growing their own" teacher leaders or resource teachers from among the pool of talented, available, and experienced mathematics teachers; and this leadership development takes time.

While there are many avenues for the delivery of professional development in mathematics, not all of these efforts are "quality operations." There is a real need to support professional developers in expanding their knowledge base about "best practices" and about evaluation instruments for use in their work with teachers. One example of a series of evaluation instruments that is moving the field forward resides in the core evaluation that was designed and developed especially for the LSC program. This prototype evaluation provides professional development and classroom observation instruments, along with teacher and principal questionnaires, that add to the knowledge base about "reform."

There are also large geographic areas throughout the U.S. that haven't yet been brought "on board" for teacher enhancement with standards-based instructional materials in mathematics.

Change is slow in coming at the high school level. The involvement of higher education faculty (from departments of mathematics and colleges of education) is essential if the desired changes at the secondary level are to be accomplished and accepted. University faculty can speak with credible voices in support of newer instructional materials and high school course titles that differ from those with which parents are most familiar. It is the universities that must reassure students (and their parents) that they will be competitive for admission to top institutions after completion of such a program of study in mathematics. Higher education is also essential to the reform of pre-service education. Although some change is beginning to show in colleges/universities, higher education is not "on board" at this point.

4. Issues?

Perhaps the most compelling issue is that of coordinating professional development with the implementation of high-quality instructional materials and student assessment. Fragmentation is prevalent.

Another important issue is the often-negative response of parents to classroom styles, instructional materials, and student assessment that are very different from what they experienced when they were in school. While local responses can be helpful, having to wage the battle district by district

is expensive and time-consuming. We need to find effective ways of educating a broad public.

There is frequently a significant programmatic gap between the vision of what a mathematics classroom should be and the reality of what must be done to get there. The public wants credible results right away; yet, the remedies are complex and involve long-term commitments for professional development, etc. The issue is how to educate both the public and (sometimes) the teachers themselves.

How do we persuade higher education that its involvement is essential both for its role in pre-service education and for the credibility it brings for making changes at the high school level? At the elementary level, how do we guarantee a coherent, long-term plan for teacher enhancement in mathematics, given that districts frequently focus on professional development in mathematics one year, reading the next, and so on?

5. Recommended objectives for the action plan

Provide longer-term professional development in mathematics, in greater depth, for more teachers through Eisenhower and NSF funds; and promote higher standards of quality and accountability in this professional development.

Develop mechanisms that increase the degree to which local Eisenhower funds are utilized to implement research-proven strategies for teaching mathematics.

Use the current heightened focus on education and national interest in TIMSS as an opportunity to educate the public about the NCTM Standards, and standards-based instructional materials and classroom styles of teaching/learning; also to reach a greater number of mathematics educators.

Encourage greater communication and clearer linkages among the K-12 mathematics community, higher education, and the professional associations in mathematics (American Mathematical Society, Mathematical Association of America, American Statistical Association, NCTM, etc.).

Engage in long-term, strategic planning to identify, disseminate, and promote the adoption of instructional materials and exemplary strategies for professional development at all levels.

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DRAFT: March 24, 1997

Presidential Mathematics Directive --
Improving Curriculum

1. What has already been done?

NSF-developed high-quality instructional materials are available for implementation in grades K-8 and are becoming available for grades 9-12. Quality standards-based instructional materials in mathematics have been developed with NSF funding over the last 6 years. The K-8 materials have been published commercially and, by fall 1997, are ready for full adoption at all levels. However, most have been already released at least in part and some grade 9-12 materials, namely Core-Plus and IMP, are already available commercially now for grades 9 and 10. The remainder will be completed by Fall, 1998.

ED has designated and disseminated numerous exemplary and promising mathematics programs. While NSF has focused on supporting the development of high-quality materials, ED has instead focused on identifying, validating and disseminating exemplary and promising mathematics programs, many of which include curricula as well as teaching training components. In 1995, ED's Eisenhower Regional Consortia for Mathematics and Science Education (Eisenhower consortia) and regional educational laboratories identified 117 promising practices for teaching mathematics and science. Previously, the National Diffusion Network had provided support for disseminating and implementing twenty nationally validated mathematics programs, each with demonstrated evidence of effectiveness. (May want to add something about contributions from the Math R&D Center or Eisenhower state program)

2. What is working?

Evidence shows that high-quality mathematics materials and programs have a positive influence on student learning. The NSF document, "The Success of Standards-based Mathematics Curricula for all Students: A Preliminary Report" is available and outlines the success of these instructional materials in field tests in diverse settings. Other evaluation data exists from the projects themselves. Similarly, some of the programs disseminated and evaluated by ED have clearly been successful.

3. Where are some critical gaps?

Schools need extensive support for evaluating and implementing curricula. New NSF curricula are not being implemented as widely as they could be, partly due to local choice issues and the need to work directly with schools and communities. NSF has funded a number of center type projects to facilitate implementation, including:

- A project to provide professional development materials for any school using any one of the three NSF-funded elementary projects;
- A very successful project to provide advice and technical assistance and some professional development in the state of Massachusetts for implementing quality standards-based science and/or mathematics materials in grades K-12; and
- A national site for implementation of quality grades 9-12 mathematics materials.

NSF would have liked to fund sites like the one for grades 9-12 at both the elementary and middle school level in FY97 but the projects submitted did not review well enough; they hope to be able to do so in FY98. These national dissemination sites are critical as they provide schools with the

necessary expertise to choose and implement quality materials.

Many of the popular traditional mathematics materials and programs may neither be challenging nor instructionally effective. TIMSS has much to suggest about ways in which curricula and programs can be strengthened, particularly by focusing the curriculum and providing more in-depth learning opportunities for each topic (a key feature of the NCTM standards). OERI and NCES (and some of the national organizations, e.g. AAAS) are working on tool kits to help local educators analyze their textbooks and curricula against TIMSS and NAEP frameworks; these will be widely disseminated as they become available.

ED--through the Eisenhower National Clearinghouse for Science and Mathematics Education (ENC)-- will be reviewing the range of programs that have been designated previously as exemplary and promising programs to assess which of those most closely match the NCTM standards and the TIMSS pedagogy and content findings. OERI is also supporting an expert panel to help identify additional exemplary and promising mathematics programs as candidates for dissemination.

We also propose that we examine closely some of the after-school enrichment programs that have become popular, like Hands-On Science, Family Math and Family Science. These have been both praised (for involving children in after-school science and math activities) and criticized (for not necessarily being good science and for not being offered in a context that promotes broader learning about science and mathematics).

4. Issues:

Ensuring and informing choice. Providing access to a broad range of high quality materials while helping districts to make informed choices among them will be a critical issue in framing this initiative. To avoid getting into the business of marketing specific products, NSF will not fund a center or other type of project that is designed to implement exclusively one set of materials, except through local systemic change teacher enhancement projects where the district has already chosen the set of materials. On the other hand, ED has provided funds for dissemination and implementation assistance to project developers whose programs had received national validation; however, there were always many such programs for districts and states to choose among. Schools need expertise to choose quality materials and to understand and provide professional development around the materials. The issue is the capacity of the system to deliver this needed technical assistance. The teachers who field test these materials are in great demand, but cannot get away from their classrooms to assist others as much as they are needed.

Providing support for implementation of high-quality standards-based materials. The local systemic change K-8 teacher enhancement projects in math and science are designed to provide the professional development around implementation of quality materials. Unfortunately, of the 40 projects funded to date only 6 have been in math. The local systemic change 7-12 in math started in late 1996 and 7 have been funded. The issue is getting projects submitted, in other words getting people willing to deliver the needed professional development for implementation of quality materials!

Ensuring public support and demand for high-quality, demanding curricula. Vivid memories of "The New Math" seem to have instilled a lingering public cynicism toward mathematics reform efforts. A small but vocal minority of the public is waging a war of "back to basics," not understanding that the basics have been increased and that challenging materials can benefit all students. The issue is how to reach the public with the successes of these new materials on all standard measurements, including NAEP and TIMSS. A public campaign can't be waged from inside the Beltway, so this effort must seek broad grassroots support.

5. Proposed objectives for the action plan.

Three curriculum-related objectives for the action plan can be derived from the discussions above, including:

- **Provide support to schools to help them make informed choices among high-quality materials;**
- **Provide support to schools to help them implement high-quality standards-based materials; and**
- **Encourage public support and demand for high-quality, demanding curricula.**

Some thoughts about strategies to support those objectives include:

1. Get the Mathematical Sciences Education Board or similar organization to launch a campaign for quality materials - NCTM will buy in but won't lead.

2. Challenge the community to submit proposals to provide assistance for schools who want to do the implementation - encourage regional consortia to take this as a mission.

3. Ramp the professional development in mathematics through Eisenhower and NSF; evoke more proposals.

4. Challenge the Presidential Awardees in mathematics to take a bigger role in all activities.

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Here is the draft on question 3, from Deborah Spitz and Eric Hamilton. We'll bring a formatted hard-copy to the mtg.

IMPROVING MATH AND SCIENCE EDUCATION
Framework: Technology (#3)

Eric Hamilton, NSF
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I. What's Out There/ What's Working?

The integration of technology into education (and, specifically, K-8 mathematics and science education) has produced countless surveys of practices ("best" and otherwise). These typically become outdated quite rapidly. SRI's 1995 Integration of Technology in School Reform examines various integration efforts in some detail, and extracts important and enduring lessons. Southern Technology Corporation's April, 1997 Best Practices Compendium identifies 500 examples of school technology implementation across the country (though concentrating primarily on the 19 states in the Council). It uses an organized set of vignettes to clarify various issues and approaches to technology integration. Other efforts focus on demonstrating practices, such as the Eisenhower Technology Demonstration Sites. The Council of Great City Schools is about to launch a "virtual

demonstration site" of best practices through its national network of school system technology coordinators. In less systematic but certainly inclusive fashion, hundreds of web sites identify various best practice niches, as does an increasingly mature educational technology literature.

Various public and private networks consolidate and organize innovations that may become more widespread practice. IBM's Reinventing Education effort links a growing number of awardees nationally in school reform adaptations of technology. Each special project has its own focus on technology innovation in reform, with the explicit design that a carefully designed national network of these projects will enhance the corporate presence in the school reform and technology marketplace. Apple's ACOT program has similar goals. Oracle announced a major national initiative in February to promote low-cost, high access network computing environments.

Similarly, the major federal (and similar local state-funded) initiatives not only promote technology innovation implementations, but also, in so doing, form embryonic best practices networks. Though overlapping in various areas, the major initiatives have certain specialized features - the TIAAP (Commerce) effort reaches across a broader spectrum of applications (i.e., not only education), local agencies, and funding eligibilities (including infrastructure). The Technology Innovation Challenge (DoED) effort supports imaginative designs to broaden implementation of innovations within education in all subject areas. The NSF initiatives (AAT, NIE, CRLT, REPP) focus, in part, on research and development of various technologies that either accelerate and deepen individual and collaborative science and math learning by students, or that deepen the content and pedagogical capabilities of teachers.

Additionally, various not-for-profit and for-profit entities either promote internally-developed or disseminate adapted models of technology integration. Among these are Educational Development Corporation, the Technical Education Research Center (TERC), and the Lifelong Learning Center (L3C) at the University of Colorado.

It is not possible to catalog exhaustively the types of best practice instances, compendia, or dissemination vehicles, though the above hopefully provides a flavor of some trendlines that can help inform some of the activities of the working group.

A fuller analysis of practices may use dimensions such as the following:
* Technological media (software, telecommunication, video, instrumentation, calculators, etc);
* Domain of endeavor (instruction, professional development, assessment, administration, communication, etc.);
* Enhancement structure (means or synergies by which the technology mediation multiplies, motivates or otherwise stimulates productivity);
* Human and fiscal resources;
* Social structures (partnerships or connections forged at different points);
* Integration to broader system reform developments (e.g., policy linkages)

II. Where are the Gaps/Issues?

Various gaps, noted below, involve professional development, high-quality, standards-based materials, and assessment. In addition to the gaps within each of these areas, there is a coordination gap. That is, the gap not only exists in integrating technology into professional development, or into instructional materials, etc., but it also exists in integrating into coordinated sequences of instruction, professional development, and assessment, tightly integrated with and enhanced by various technology media. That is, not only do such sequences rarely exist, but they are not technologically embedded, let alone enhanced. There is, by definition, little research-grounding for such sequences nor for technological enhancements to them.

A. Professional Development

Many barriers to effectively integrating technology into math and science courses occur in the area of professional development. Primarily, if teachers are not instructed on effective integration techniques, and are not properly motivated, technology will not be effectively utilized. Below are some specific areas of concern.

* Effective training: It is unclear whether much professional development in the area of technology is being done effectively, and it is also unclear which types of training are most effective. This is a concern in both preservice and inservice training.
* Linking technology to curriculum: There is much discussion of effective use of technology in the classroom. Research shows that technology is most effective when linked to the specific curriculum. In the case of math and science, it is important to ask the question, how can technology be used in the MATH classroom, and the SCIENCE classroom, and how does technology use for each of these subjects differ from other subjects? And how can we communicate this information to teachers?
* Reaching large numbers of teachers.
* Motivating teachers to develop technology skills: Resistance by teachers to learning technology results in less effective technology integration. The primary causes of such resistance should be considered, and we should look for ways to increase motivation. A major concern is that teachers are likely to resist any additional demands on their time. Technology should be presented to teachers in a way that minimizes burdens, and emphasizes the ways in which technology can HELP the teacher function more efficiently. In other words, technology can be presented as a time-saver, not just an additional teaching requirement. For example, technology can speed up the process of distributing and turning in assignments, and make the grading process quicker and more accurate. Technology can also be used for individual or group work in the classroom, freeing up the teacher to complete other tasks or to provide more personal attention to students needing help. Another problem is that teachers often feel threatened by technology, particularly as students may learn more quickly and "bypass" the teacher. Children tend to see technology as entertaining while adults see it as an intimidating new skill to be learned. However, public perception of technology is changing rapidly as it becomes more commonly used, and this may no longer be a concern.

B. Materials/Access

* Development of quality software: Because educational software is developed and sold on the commercial market, quality programs have in the past been unavailable. This is because

the market for educational materials is limited and provides less incentive for entrepreneurial development, particularly in more specialized content areas. It is important to consider what software has been developed for math and science instruction, and whether this software is high quality and standards-based. We need to consider what role the government plays in influencing the content and quality of software development. The Department of Education has suggested that the development of high quality software depends on greater collaboration between educators and the private sector. (NSF is promoting an effort to advance interoperable software systems to increase the utility of applications that are highly innovative but limited in domain.) This can be accomplished, and is being accomplished, through sponsoring workshops and providing grants for innovative software development. This is an area that has changed dramatically over the last decade, so reevaluation of available software is important.

* Linking technology to the curriculum: This is similar to the concerns relating to professional development, as it pertains to materials used in the classroom. Is the equipment and software being linked to the curriculum in math and science classes, and to the standards of each state or the NCTM?

* Increasing access to technology: Finally, much work remains to be done in providing disadvantaged students with access to technology. A recent report by NCES revealed that among schools with low concentrations of poor students, 62 percent had Internet access, while schools with high concentrations of poor students had a 47 percent access rate, and schools with the highest concentrations (71 percent or more students eligible for free or reduced price lunches) had only a 31 percent rate of Internet access. The implementation of the recent Telecommunications Act, or the "E-rate", will be one important factor in reducing this disparity. However, even where low-income students have access to computers in schools, they are still at a loss when compared to students with computers at home. The government should consider efforts to increase student access outside school hours, through after-school programs, wiring of public housing and libraries, and other community efforts.

C. Assessment

* Measuring effectiveness of technology use and reform efforts: Much work has already been done in measuring the benefits of increased technology use, though many of these benefits remain speculative. Continued research on student outcomes is important. However, we need also to measure the outcomes of our efforts in this area: which programs and government actions have been most effective in increasing access and integration of technology in the classroom? How can this be measured? Calculating the ratio of students to computers, as NCES has done, is only a beginning.

* Using technology to improve the assessment of student performance: We can also use educational technology to improve the way students are assessed by their teachers, with the goal of improving educational outcomes. Technology can allow for more individualized and creative assessments, by allowing teachers to better track the progress of their students and intervene when a student's performance suffers. We should be looking at creative ways of using technology to improve teachers' assessments of student progress. For example, technology can be used to create student "portfolios", or computer files where all assignments are stored and may be linked together in a variety of ways.

The problem of integrating technology into the domains of professional development, materials, and instruction mirrors another significant gap in "what is out there," i.e., the

problem of integrating various social enterprises or agencies. The importance of public/private partnerships has been noted. Collaboration between various agencies and branches of government is also a promising but poorly developed area. But the rationale is compelling. Unitary planning involving a telco, the municipal library system, the municipal government, health care providers, the housing authority, and the school system will promote many positive reform agendas. Such collaborations rarely take place, though cities such as Memphis and Pittsburgh are exceptions.

INTERAGENCY COMMITTEE ON SCIENCE AND MATHEMATICS EDUCATION

Motivate students and help them understand how math concepts are applied in the real world.

This component connects the notion of content standards in mathematics and science with how parents and communities can help children and schools achieve at world-class levels, how the media and business and industry can be enlisted in public service campaigns, and how to bring these resources together nationally and locally to raise the visibility of the need of improved mathematics education.

What has already been done?

Research

The Federal government has sponsored relevant research about student motivation. Studies of Constructive thinking should help understand how students are motivated by becoming engaged in the content of mathematics and science (OERI, NCES, and NSF support such research). Analyses of NAEP data indicate that a growing percentage of students at 4th and 8th grades are receiving more exposure to mathematical topics such as measurement, statistics, and algebra andfunctions. However, the focus continues to emphasize facts and concepts, skills and procedures rather than on developing reasoning ability to solve unique problems.

Analyses of NELS data indicate that secondary school Afro American, Hispanic, and Native American students math achievement is lower than that of White/Non-Hispanic or Asian-American students. Data indicate that the former group of students have fewer parents in math/science fields to serve as role models (mentors or role models are believed to play an important role in students' career development). These students also have fewer learning opportunities outside school (e.g., access to learning materials, participation in supplementary classes or parent-provided educational activities). Finally, these students are less likely to receive adequate help from parents in completing math and science homework, and are more likely to find these subjects more difficult and frustrating. Also, studies and implemented programs have been carried out that attempt to understand how schools might be organized to insure that students of differing ethnic backgrounds become motivated to participate in quality science and mathematics study.

Comparative international research sponsored by ED and NSF has shown that there is a strong belief in the U.S. that mathematical proficiency is due more to inherent ability than to effort, while the reverse belief is held in countries including China and Japan, countries outperforming the U.S. in mathematics assessments.

Programs

NSF and ED have supported the development of computer tools designed to increase student motivation by showing mathematics in action. Some of these can be observed in existing Web-sites. For example, the University of Wisconsin has a project to present interesting versions of science phenomenon in the news and study how the web-site is used in classes.

NSF has supported implementation projects that attempt to integrate mathematicians and scientists from colleges and universities into lower grades. ED supports a number of

programs (including Star Schools, Challenge Grants, Magnet Schools, the National Eisenhower Programs) that may fund projects designed to promote the type of math instruction that fosters student interest and achievement in the middles grades, and that seeks to engage underserved and underachieving populations). There are also several large programs in ED that have strong parent participation components, including Title I and Even Start, to engage parents more directly and effectively in their children's academic achievement. Some of the FIPSE grants made by ED to colleges and universities have sought to revise college math curricula to demonstrate the application of various mathematical concepts.

Products

ED has supported the development and dissemination of a variety of products for parents, educators, and community members on the subjects of helping students with mathematics, connecting mathematics to the real world, and placing the study of mathematics in a multicultural context. Many of these products are aimed at the elementary school grades.

What is working?

Hands-on science experiments in classrooms (or as supplemental after school activities) motivates students. Computer applications in classrooms apply mathematics and science. Providing kits (and information) to parents for learning activities has been shown to be effective; these activities have generally been targeted at elementary age students.

The First in the World Consortium of IL school districts who generated a community level campaign within and outside schools to promote students' math achievement and high performance on the TIMSS assessment were successful in garnering attention, interest, and support. Past programs like the Academic Fitness Awards (are cognition of students' academic performance analogous to the Physical Fitness Awards) provide incentives for students.

Introducing mathematicians to students has not been a big success.

Gaps

There remain gaps in our knowledge of the teaching and learning process, including the issue of providing an appropriate learning environment (in terms of curricular material, teacher, pedagogical style) for our increasingly diverse student population.

We also need more study of the articulation between the elementary and secondary math curriculum to understand the effect of the elementary school experience on students' interest in continuing their mathematics studies. Why is math students' favorite subject in elementary school but much less popular at the secondary level?

Finally, we need to be able to demonstrate and then scale up how to implement the high quality mathematics and science standards being developed at all levels of the public school system.

Issues

At the national level:

How can the media be enlisted to reach parents with the need to encourage/foster their students' mathematical learning, and to reach students with a clear message about the need for hard work and practice associated with the development of any skill and with the importance of studying mathematics for their futures in the global economy?

How can the media assist in increasing public awareness of the national goal related to mathematics performance (and the reasons behind it)?

How can business and industry be enlisted to provide incentives for students' achievements?

State and local levels:

International studies show US students value mathematics about the same as do students in other countries. However, their achievement is lower. US students are not as likely to believe that their "friends" value mathematics as much as do their mothers. Thus, it appears that community support (perhaps especially the support of peers) is important. How can businesses and community organizations provide outside, extra-school learning opportunities to increase students' mathematical understanding and achievement?

How can businesses and community organizations assist parents to play effective roles in their children's learning?

How can businesses and community organizations reinforce the national message about the Presidential Initiative with local campaigns and incentives, and recognition programs?

Recommended objectives for the action plan

Increase students' understanding of the need to exert effort to become a champion in any field of endeavor (including mathematics).

Increase community and students' understanding of the importance of mathematical proficiency for future job and educational opportunities.

Students need to believe that their friends and family believe that mathematics is important for their lives. The government should provide national examples of persons of different occupations using math in work settings.

Communities should examine the results of international studies to understand how students in other countries learn better mathematics than do US students.

Also, good classroom materials help motivate students.

Improve the supply and use of modern technology to increase student motivation and understanding of mathematics.

Improve the available resources to support students and parents' efforts to increase student mathematical proficiency.

Mathematics & Science Lessons & Activities in Classrooms Across the Country
U.S. Department of Education

Question: How can we make high quality, standards-based mathematics & science lessons & activities available to teachers and students in classrooms across the country?

Assumption: The most popular item on the Internet, among teachers, is lesson plans.

Picture two images:

1. Imagine a teacher sitting at a computer and typing (into a specially designed search engine) the topic and grade level for which they'd like to browse lesson plans and instructional materials (probability for 5th graders, for instance). The search goes out to multiple participating web sites (including those already established by AskERIC & the Eisenhower National Clearinghouse) & brings up appropriate lesson plans & instructional materials.

2. Imagine a scientist who is doing research on aerodynamics, alternative energy sources, water pollution or any other challenge. Or picture an engineer who is helping design a bridge, high speed rail, or some other structure or system. Maybe this scientist or engineer wants to share her/his exciting work -- and the science or mathematics underlying it -- with teachers and students.

The Project: We can help teachers bring science & mathematics to life for students by making it easy for them to find lesson plans & learning activities that can improve learning in their classrooms. We can also reduce the time separating two moments: the moment when a discovery is made in a lab and the day when that discovery -- and the science and mathematics underlying it -- are studied in classrooms across the country.

We can make this happen through the following steps.

First, our National Library of Education (NLE) is now supporting a project to develop a search engine and process for searching across multiple web sites for a particular lesson plan, learning activity, or instructional material at a specified grade level. This can make the many lesson plans and instructional materials on participating web sites easy to find. Organizations and agencies that have sponsored the development of lesson plans, instruction units, or learning activities -- particularly if those materials have been gathered and made available on the web -- can participate in the NLE project.

But we must also strengthen the quality of what teachers find when conducting a search. One way we can do this is by encouraging master teachers to make their best lesson plans available through this project. Another way is by matching individual scientists, engineers, and other professionals (supported by federal agencies) with teachers who want to work with them to develop lesson plans, learning activities, and instructional units and materials. We would like to test this concept with a handful of teachers and federally supported scientists and engineers. Through this pilot test, we would like to develop a scalable process for supporting collaboration between teachers and scientists that is efficient, mutually satisfying, and that works.

We are open to other ideas on how we can work together to develop more high quality instructional materials that would be available on the web and easily found through the NLE project.

jsunley @ nsf.gov
03/20/97 10:24:00 AM

Record Type: Record

To: Daryl E. Chubin, Michael Cohen, William R. Kincaid

cc:
Subject: ED/NSF interagency working group

Folks,

What follows is a tentative agenda for next week's meeting of the working group. We will be joined by two people from OMB, Mary Cassell and Anne Tenney.

It would be helpful if the assignments of the subgroups could be e-mailed or faxed to the full group in advance of the meeting. The draft timeline should be in your hands either later today or early tomorrow.

Judy Sunley

ED/NSF Interagency Working Group

Tentative agenda for next Tuesday.

Time: 3:00 p.m.

Place: NSF Headquarters; Room 1295

Items for discussion:

1. Draft Framework

2. Draft Timeline

3. Establishing the baseline for an action plan

-- Outcome of working group consideration: teachers; curriculum and materials; technology; and students.

-- Obtaining input from stakeholders, including other Federal agencies (including discussion of appropriate stakeholder groups for contact)

-- Obtaining a briefing on test design, its relation to standards

-- Obtaining a good reading on the environment in which the action plan will be implemented: school/local/state/federal/private sector interactions

4. Other items

- Beginning seem so skeletal
  or to be unclear
  what happens.
- Timeline seem to work
  by about emphasis
  input - not clear
  what the substance
  gets down.

jsunley @ nsf.gov
03/21/97 03:43:00 PM

Record Type: Record

To: Daryl E. Chubin, Michael Cohen, William R. Kincaid

cc:
Subject: draft timeline (yet again)

MIME-Version: 1.0
Content-type: text/enriched; charset=us-ascii
Content-transfer-encoding: 7BIT

My apologies. I have never had this happen before. I hope this time that it will work.

Judy Sunley

<fontfamily><param>Times</param>Complete Baseline

by March 24:

- Federal programs

- Other Federal activities

by March 31:

- Test design

- Environment

by April 4:

- Input from stakeholders

by April 15:

- Completed baseline

<bold>

</bold>Preliminary Response

by April 25:

- actions based on existing programs with clear potential for impact by 99 ready for public release

<bold>

</bold>Outline of Action Plan

by April 25:

- outline of major areas for action in each of the four framework areas

by May 2:

- tentative staging of those actions with assignment of responsibility

- suggested actions outside the four framework areas as needed

<bold>

</bold>Consultation

by May 2:

- initiate consultation with stakeholders

by May 15:

- complete consultation with stakeholders

<bold>

</bold>Draft Action Plan

May 2-May 15

- complete draft

by May20

- incorporate stakeholder comments for final draft

<bold>

</bold>Agency, OSTP, DPC Concurrence

- complete by May 31

<bold>

</bold>Submit to President by June 3

</fontfamily>

INTERAGENCY COMMITTEE ON SCIENCE AND MATHEMATICS EDUCATION

4. Motivate students and help them understand how math concepts are applied in the real world.

This component connects the notion of content standards in mathematics and science with how parents and communities can help children and schools achieve at world-class levels, how the media and business and industry can be enlisted in public service campaigns, and how to bring these resources together nationally and locally to raise the visibility of the need of improved mathematics education.

1. What has already been done?

Research

The Federal government has sponsored relevant research about student motivation. Studies of Constructive thinking should help understand how students are motivated by becoming engaged in the content of mathematics and science (OERI, NCES, and NSF support such research).

Analyses of NAEP data indicate that a growing percentage of students at 4th and 8th grades are receiving more exposure to mathematical topics such as measurement, statistics, and algebra and functions. However, the focus continues to emphasize facts and concepts, skills and procedures rather than on developing reasoning ability to solve unique problems.

Analyses of NELS data indicate that secondary school Afro-American, Hispanic, and Native American students' math achievement is lower than that of White/Non-Hispanic or Asian American students. Data indicate that the former group of students have fewer parents in math/science fields to serve as role models (mentors or role models are believed to play an important role in students' career development). These students also have fewer learning opportunities outside school (e.g., access to learning materials, participation in supplementary classes or parent-provided educational activities). Finally, these students are less likely to receive adequate help from parents in completing math and science homework, and are more likely to find these subjects more difficult and frustrating. Also, studies and implemented programs have been carried out that attempt to understand how schools might be organized to insure that students of differing ethnic backgrounds become motivated to participate in quality science and mathematics study. Comparative international research sponsored by ED and NSF has shown that there is a strong belief in the U.S. that mathematical proficiency is due more to inherent ability than to effort, while the reverse belief is held in countries including China and Japan, countries outperforming the U.S. in mathematics assessments.

Programs

NSF and ED have supported the development of computer tools designed to increase student motivation by showing mathematics in action:. Some of these can be observed in existing Web sites. For example, the University of Wisconsin has a project to present interesting versions of science phenomenon in the news and study how the web site is used in classes.

NSF has supported implementation projects that attempt to integrate mathematicians and scientists from colleges and universities into lower grades.

ED supports a number of programs (including Star Schools, Challenge Grants, Magnet Schools, the National Eisenhower Programs) that may fund projects designed to promote the type of math instruction that fosters student interest and achievement in the middles grades, and that seeks to engage underserved and underachieving populations). There are also several large programs in ED that have strong parent participation components, including Title I and Even Start, to engage parents more directly and effectively in their children's academic achievement.

Some of the FIPSE grants made by ED to colleges and universities have sought to revise college math curricula to demonstrate the application of various mathematical concepts.

Products

ED has supported the development and dissemination of a variety of products for parents, educators, and community members on the subjects of helping students with mathematics, connecting mathematics to the "real world", and placing the study of mathematics in a multicultural context. Many of these products are aimed at the elementary school grades.

2. What is working ?

Hands on science experiments in classrooms (or as supplemental after school activities) motivates students. Computer applications in classrooms apply mathematics and science. Providing kits (and information) to parents for learning activities has been shown to be effective; theseactivities have generally been targeted at elementary age students.

The First in the World Consortium of IL school districts who generated a community level campaign within and outside schools to promote students' math achievement and high performance on the TIMSS assessment were successful in garnering attention, interest, and support.

Past programs like the Academic Fitness Awards (a recognition of students' academic performance analogous to the Physical Fitness Awards) provide incentives for students.

Introducing mathematicians to students has not been a big success.

3. Gaps

There remain gaps in our knowledge of the teaching and learning process, including the issue of providing an appropriate learning environment (in terms of curricular material, teacher, pedagogical style) for our increasingly diverse student population. We also need more study of the articulation between the elementary and secondary math curriculum to understand the effect of the elementary school experience on students' interest in continuing their mathematics studies. Why is math students' favorite subject in elementary school but much less popular at the

secondary level?

Finally, we need to be able to demonstrate and then "scale up" how to implement the high quality mathematics and science standards being developed at all levels of the public school system.

4. Issues

At the national level:

How can the media be enlisted to reach parents with the need to encourage/foster their students' mathematical learning, and to reach students with a clear message about the need for hard work and practice associated with the development of any skill and with the importance of of studying mathematics for their futures in the global economy? How can the media assist in increasing public awareness of the national goal related to mathematics performance (and the reasons behind it)

At State and local levels:

International studies show US students value mathematics about the same as do students in other countries. However, their achievement is lower. US students are not as likely to believe that their "friends" value mathematics as much as do their mothers. Thus, it appears that community support (perhaps especially the support of peers) is important.

How can businesses and community organizations provide extra-school learning opportunities to increase students' mathematical understanding and performance? How can businesses and community organizations assist parents to play effective roles in their children's learning? How can businesses and community organizations reinforce the national message of the Presidential Initiative with local campaigns, incentives, and recognition programs?

5. Recommended objectives for the action plan.

Increase students' understanding of the need to exert effort to become a champion in any field of endeavor (including mathematics).

Increase community and students' understanding of the importance of mathematical proficiency for future job and educational opportunities. Students need to believe that their friends and family believe that mathematics is important for their lives. The government should provide national examples of persons of different occupations using math in work settings. Communities should examine the results of international studies to understand how students in other countries learn better mathematics than do US students. Also, good classroom materials help motivate students.

Improve the supply and use of modern technology to increase student motivation and understanding of mathematics.

Improve the available resources to support students and parents' efforts to increase student mathematical proficiency.

jsunley @ nsf.gov
03/24/97 04:45:00 PM

Record Type: Record

To: Daryl E. Chubin, Michael Cohen, William R. Kincaid

cc:
Subject: working group draft on teachers

The draft for Group #1 is below.

Judy Sunley

Working Group on Improving Mathematics Education--Area #1: Teaching

1. What's already been done?

The Teacher Enhancement (TE) program in NSF's Division of Elementary, Secondary, and Informal Education (ESIE) has supported a large number of professional development projects to broaden and deepen the disciplinary and pedagogical knowledge of K-12 teachers in mathematics. At present, there are over a hundred active, multi-year mathematics projects in TE. These awards range from planning grants (under $ 50,000) to very large scale efforts (over $ 5 million). To ensure sustained professional development for ALL mathematics teachers in the targeted schools/districts and clear linkages with the classroom use of high quality instructional materials in mathematics, the first of ESIE's Local Systemic Change (LSC) projects for grades K-8 was funded in FY 94 within TE. This was soon followed by the Local Systemic Change projects for secondary mathematics in FY 96. To date, 13 LSC projects in mathematics have been funded through the TE program.

NSF's Division of Educational Systemic Reform has funded 15 State Systemic Initiatives (SSI), 20 Urban Systemic Initiatives (USI), and four Rural Systemic Initiatives (RSI). To varying degrees, each of these large-scale projects provides professional development in support of the vision of teaching/learning promoted by the NCTM's Standards. NSF's Collaboratives for Excellence in Teacher Preparation (CETP), funded by the Division of Undergraduate Education, have supported improved preparation of future K-12 teachers of mathematics.

The Department of Education (ED) makes funding for professional development in mathematics and science available to every State and local educational agency in the Nation through the Eisenhower Professional Development Program, currently funded at over $300 million per year. Programs, which vary widely in scope, depth, and approach, operate at three levels--those sponsored by the State education agency, those operated by institutions of higher education or non-profits as a result of statewide competition, and

those operated by local education agencies.

ED funds ten regional Mathematics and Science Consortia throughout the Nation. Central among their objectives is the commitment to developing the professional skills of today's mathematics and science teachers. The Consortia provide a rich variety of support to teachers including electronic networks, training trainers, and brokering the professional development offerings of others. Services also include coordination with the resources of the Eisenhower National Clearinghouse, another ED-funded project, which provides access to a mathematics and science resources for teachers--particularly valuable to those who are seeking new ways to teach.

ED also funds fifteen Comprehensive Centers, many of which have a professional development expert on staff to advise state and local educational agencies on improving teaching, including the teaching of mathematics.

2. What is working?

Project-specific evaluation data document numerous successes in each of the NSF program areas cited above: quality programs of professional development for teachers, increases in student achievement scores, adoption/implementation of standards-based instructional materials, and improved course-taking patterns in mathematics by students, including those who have been traditionally underrepresented. Many NSF projects afford opportunities for multi-year professional development.

In the NSF program areas cited above, there is evidence of effective partnerships involving school districts, higher education, and others (e.g., businesses and industry, teacher unions, etc.). These partners make significant cost-sharing contributions to the projects: in LSC projects, for example, it is not uncommon for cost-sharing commitments from partners, especially school districts, to actually exceed the amount of the NSF award. Such high percentages of cost-sharing are visible signs of strong programmatic and financial commitment from districts and other partners.

In the Eisenhower state and local program, there is a trend toward more sustained professional development efforts, consistent with State education reform efforts and with emphasis on giving teachers skills that are transferable to the classroom. Since States are now required to develop and report on performance indicators, many are gearing their efforts toward strategies that are expected to yield increases in scores on mathematics assessments. Most projects funded by the higher education component of the program provide evaluation data to show their effectiveness.

3. Gaps?

At present, sufficient capacity/infrastructure to deliver long-term, high quality professional development for all the nation's teachers of K-12 mathematics is lacking. Qualified professional developers with the necessary combinations of expertise/experience in disciplinary content,

pedagogical expertise, assessment, technology, etc., are in short supply, relative to the need. Districts frequently have to commit valuable resources to "growing their own" teacher leaders or resource teachers from among the pool of talented, available, and experienced mathematics teachers; and this leadership development takes time.

While there are many avenues for the delivery of professional development in mathematics, not all of these efforts are "quality operations." There is a real need to support professional developers in expanding their knowledge base about "best practices" and about evaluation instruments for use in their work with teachers. One example of a series of evaluation instruments that is moving the field forward resides in the core evaluation that was designed and developed especially for the LSC program. This prototype evaluation provides professional development and classroom observation instruments, along with teacher and principal questionnaires, that add to the knowledge base about "reform."

There are also large geographic areas throughout the U.S. that haven't yet been brought "on board" for teacher enhancement with standards-based instructional materials in mathematics.

Change is slow in coming at the high school level. The involvement of higher education faculty (from departments of mathematics and colleges of education) is essential if the desired changes at the secondary level are to be accomplished and accepted. University faculty can speak with credible voices in support of newer instructional materials and high school course titles that differ from those with which parents are most familiar. It is the universities that must reassure students (and their parents) that they will be competitive for admission to top institutions after completion of such a program of study in mathematics. Higher education is also essential to the reform of pre-service education. Although some change is beginning to show in colleges/universities, higher education is not "on board" at this point.

4. Issues?

Perhaps the most compelling issue is that of coordinating professional development with the implementation of high-quality instructional materials and student assessment. Fragmentation is prevalent.

Another important issue is the often-negative response of parents to classroom styles, instructional materials, and student assessment that are very different from what they experienced when they were in school. While local responses can be helpful, having to wage the battle district by district is expensive and time-consuming. We need to find effective ways of educating a broad public.

There is frequently a significant programmatic gap between the vision of what a mathematics classroom should be and the reality of what must be done to get there. The public wants credible results right away; yet, the remedies are complex and involve long-term commitments for professional development, etc. The issue is how to educate both the public and

(sometimes) the teachers themselves.

How do we persuade higher education that its involvement is essential both for its role in pre-service education and for the credibility it brings for making changes at the high school level?
At the elementary level, how do we guarantee a coherent, long-term plan for teacher enhancement in mathematics, given that districts frequently focus on professional development in mathematics one year, reading the next, and so on?

5. Recommended objectives for the action plan

Provide longer-term professional development in mathematics, in greater depth, for more teachers through Eisenhower and NSF funds; and promote higher standards of quality and accountability in this professional development.

Develop mechanisms that increase the degree to which local Eisenhower funds are utilized to implement research-proven strategies for teaching mathematics.

Use the current heightened focus on education and national interest in TIMSS as an opportunity to educate the public about the NCTM Standards, and standards-based instructional materials and classroom styles of teaching/learning; also to reach a greater number of mathematics educators.

Encourage greater communication and clearer linkages among the K-12 mathematics community, higher education, and the professional associations in mathematics (American Mathematical Society, Mathematical Association of America, American Statistical Association, NCTM, etc.).

Engage in long-term, strategic planning to identify, disseminate, and promote the adoption of instructional materials and exemplary strategies for professional development at all levels.

Draft by: Diane Spresser (NSF)
Clare Banwart (ED)

jsunley @ nsf.gov
03/24/97 04:47:00 PM

Record Type: Record

To: Daryl E. Chubin, Michael Cohen, William R. Kincaid

cc:
Subject: document on materials

Here is the document from group #2.

Judy

DRAFT: March 24, 1997

Presidential Mathematics Directive --
Improving Curriculum

1. What has already been done?

NSF-developed high-quality instructional materials are available for implementation in grades K-8 and are becoming available for grades 9-12. Quality standards-based instructional materials in mathematics have been developed with NSF funding over the last 6 years. The K-8 materials have been published commercially and, by fall 1997, are ready for full adoption at all levels. However, most have been already released at least in part and some grade 9-12 materials, namely Core-Plus and IMP, are already available commercially now for grades 9 and 10. The remainder will be completed by Fall, 1998.

ED has designated and disseminated numerous exemplary and promising mathematics programs. While NSF has focused on supporting the development of high-quality materials, ED has instead focused on identifying, validating and disseminating exemplary and promising mathematics programs, many of which include curricula as well as teaching training components. In 1995, ED's Eisenhower Regional Consortia for Mathematics and Science Education (Eisenhower consortia) and regional educational laboratories identified 117 promising practices for teaching mathematics and science. Previously, the National Diffusion Network had provided support for disseminating and implementing twenty nationally validated mathematics programs, each with demonstrated evidence of effectiveness. (May want to add something about contributions from the Math R&D Center or Eisenhower state program)

2. What is working?

Evidence shows that high-quality mathematics materials and programs have a positive influence on student learning. The NSF document, "The Success of Standards-based Mathematics Curricula for all Students: A Preliminary Report" is available and outlines the success of these instructional

materials in field tests in diverse settings. Other evaluation data exists from the projects themselves. Similarly, some of the programs disseminated and evaluated by ED have clearly been successful.

3. Where are some critical gaps?

Schools need extensive support for evaluating and implementing curricula. New NSF curricula are not being implemented as widely as they could be, partly due to local choice issues and the need to work directly with schools and communities. NSF has funded a number of center type projects to facilitate implementation, including:

* A project to provide professional development materials for any school using any one of the three NSF-funded elementary projects;

* A very successful project to provide advice and technical assistance and some professional development in the state of Massachusetts for implementing quality standards-based science and/or mathematics materials in grades K-12; and

* A national site for implementation of quality grades 9-12 mathematics materials.

NSF would have liked to fund sites like the one for grades 9-12 at both the elementary and middle school level in FY97 but the projects submitted did not review well enough; they hope to be able to do so in FY98. These national dissemination sites are critical as they provide schools with the necessary expertise to choose and implement quality materials.

Many of the popular traditional mathematics materials and programs may neither be challenging nor instructionally effective. TIMSS has much to suggest about ways in which curricula and programs can be strengthened, particularly by focusing the curriculum and providing more in-depth learning opportunities for each topic (a key feature of the NCTM standards). OERI and NCES (and some of the national organizations, e.g. AAAS) are working on tool kits to help local educators analyze their textbooks and curricula against TIMSS and NAEP frameworks; these will be widely disseminated as they become available.

ED--through the Eisenhower National Clearinghouse for Science and Mathematics Education (ENC)-- will be reviewing the range of programs that have been designated previously as exemplary and promising programs to assess which of those most closely match the NCTM standards and the TIMSS pedagogy and content findings. OERI is also supporting an expert panel to help identify additional exemplary and promising mathematics programs as candidates for dissemination.

We also propose that we examine closely some of the after-school enrichment programs that have become popular, like Hands-On Science, Family Math and Family Science. These have been both praised (for involving children in after-school science and math activities) and criticized (for not necessarily being good science and for not being offered in a context that

promotes broader learning about science and mathematics).

4. Issues:

Ensuring and informing choice. Providing access to a broad range of high quality materials while helping districts to make informed choices among them will be a critical issue in framing this initiative. To avoid getting into the business of marketing specific products, NSF will not fund a center or other type of project that is designed to implement exclusively one set of materials, except through local systemic change teacher enhancement projects where the district has already chosen the set of materials. On the other hand, ED has provided funds for dissemination and implementation assistance to project developers whose programs had received national validation; however, there were always many such programs for districts and states to choose among. Schools need expertise to choose quality materials and to understand and provide professional development around the materials. The issue is the capacity of the system to deliver this needed technical assistance. The teachers who field test these materials are in great demand, but cannot get away from their classrooms to assist others as much as they are needed.

Providing support for implementation of high-quality standards-based materials. The local systemic change K-8 teacher enhancement projects in math and science are designed to provide the professional development around implementation of quality materials. Unfortunately, of the 40 projects funded to date only 6 have been in math. The local systemic change 7-12 in math started in late 1996 and 7 have been funded. The issue is getting projects submitted, in other words getting people willing to deliver the needed professional development for implementation of quality materials!

Ensuring public support and demand for high-quality, demanding curricula. Vivid memories of "The New Math" seem to have instilled a lingering public cynicism toward mathematics reform efforts. A small but vocal minority of the public is waging a war of "back to basics," not understanding that the basics have been increased and that challenging materials can benefit all students. The issue is how to reach the public with the successes of these new materials on all standard measurements, including NAEP and TIMSS. A public campaign can't be waged from inside the Beltway, so this effort must seek broad grassroots support.

5. Proposed objectives for the action plan.

Three curriculum-related objectives for the action plan can be derived from the discussions above, including:

* Provide support to schools to help them make informed choices among high-quality materials;
* Provide support to schools to help them implement high-quality standards-based materials; and
* Encourage public support and demand for high-quality, demanding curricula.

Some thoughts about strategies to support those objectives include:

1. Get the Mathematical Sciences Education Board or similar organization to launch a campaign for quality materials - NCTM will buy in but won't lead.

2. Challenge the community to submit proposals to provide assistance for schools who want to do the implementation - encourage regional consortia to take this as a mission.

3. Ramp the professional development in mathematics through Eisenhower and NSF; evoke more proposals.

4. Challenge the Presidential Awardees in mathematics to take a bigger role in all activities.

Drafted by: Midge Cozzens (NSF)
Bob Stonehill (ED)

ehamilto @ nsf.gov
03/25/97 09:40:00 AM

Record Type: Record

To: Daryl E. Chubin, Michael Cohen, William R. Kincaid

cc:
Subject: Re: working group documents

Here is the draft on question 3, from Deborah Spitz and Eric Hamilton. We'll bring a formatted hard-copy to the mtg

IMPROVING MATH AND SCIENCE EDUCATION
Framework: Technology (#3)

Eric Hamilton, NSF
Deborah Spitz, DoED

I. What's Out There/ What's Working?

The integration of technology into education (and, specifically, K-8 mathematics and science education) has produc gy in School Reform examines various integration efforts in some detail, and extracts important and enduring lesson ss the country (though concentrating primarily on the 19 states in the Council). It uses an organized set of vignettes ower Technology Demonstration Sites. The Council of Great City Schools is about to launch a "virtual demonstratio fash
ion, hundreds of web sites identify various best practice niches, as does an increasingly mature educational technolo

Various public and private networks consolidate and organize innovations that may become more widespread practi project has its own focus on technology innovation in reform, with the explicit design that a carefully designed nation has similar goals. Oracle announced a major national initiative in February to promote low-cost, high access networ

Similarly, the major federal (and similar local state-funded) initiatives not only promote technology innovation imple ve certain specialized features - the TIAAP (Commerce) effort reaches across a broader spectrum of applications (i. ffort supports imaginative designs to broaden implementation of innovations within education in all subject areas. Th eepen individual and collaborative science and math learning by students, or that deepen the content and pedagogic

Additionally, various not-for-profit and for-profit entities either promote internally-developed or disseminate adapte and the Lifelong Learning Center (L3C) at the University of Colorado.

It is not possible to catalog exhaustively the types of best practice instances, compendia, or dissemination vehicles,

A fuller analysis of practices may use dimensions such as the following:
* Technological media (software, telecommunication, video, instrumentation, calculators, etc);
* Domain of endeavor (instruction, professional development, assessment, administration, communication, etc.);
* Enhancement structure (means or synergies by which the technology mediation multiplies, motivates or otherwise
* Human and fiscal resources;
* Social structures (partnerships or connections forged at different points);
* Integration to broader system reform developments (e.g., policy linkages)

II. Where are the Gaps/Issues?

Various gaps, noted below, involve professional development, high-quality, standards-based materials, and assess ology into professional development, or into instructional materials, etc., but it also exists in integrating into coordinat edia. That is, not only do such sequences rarely exist, but they are not technologically embedded, let alone enhanc

A. Professional Development

Many barriers to effectively integrating technology into math and science courses occur in the area of professional d l not be effectively utilized. Below are some specific areas of concern.

* Effective training: It is unclear whether much professional development in the area of technology is being done effe
* Linking technology to curriculum: There is much discussion of effective use of technology in the classroom. Resea k the question, how can technology be used in the MATH classroom, and the SCIENCE classroom, and how does te
* Reaching large numbers of teachers.
* Motivating teachers to develop technology skills: Resistance by teachers to learning technology results in less effe ation. A major concern is that teachers are likely to resist any additional demands on their time. Technology should efficiently. In other words, technology can be presented as a time-saver, not just an additional teaching requiremen more accurate. Technology can also be used for individual or group work in the classroom, freeing up the teacher t ened
by technology, particularly as students may learn more quickly and "bypass" the teacher. Children tend to see tech g rapidly as it becomes more commonly used, and this may no longer be a concern.

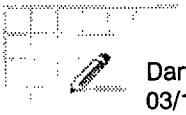
B. Materials/Access

* Development of quality software: Because educational software is developed and sold on the commercial market, e for entrepreneurial development, particularly in more specialized content areas. It is important to consider what so onsider what role the government plays in influencing the content and quality of software development. The Depart ate sector. (NSF is promoting an effort to advance interoperable software systems to increase the utility of applicati s an
d providing grants for innovative software development. This is an area that has changed dramatically over the last
* Linking technology to the curriculum: This is similar to the concerns relating to professional development, as it pert to the standards of each state or the NCTM?
* Increasing access to technology: Finally, much work remains to be done in providing disadvantaged students with access, while schools with high concentrations of poor students had a 47 percent access rate, and schools with the ss. The implementation of the recent Telecommunications Act, or the "E-rate", will be one important factor in reduci students with computers at home. The government should consider efforts to increase student access outside scho

C. Assessment

* Measuring effectiveness of technology use and reform efforts: Much work has already been done in measuring th However, we need also to measure the outcomes of our efforts in this area: which programs and government actio tio of students to computers, as NCES has done, is only a beginning.
* Using technology to improve the assessment of student performance: We can also use educational technology to idualized and creative assessments, by allowing teachers to better track the progress of their students and intervene ent progress. For example, technology can be used to create student "portfolios", or computer files where all assign

The problem of integrating technology into the domains of professional development, materials, and instruction mirro of public/private partnerships has been noted. Collaboration between various agencies and branches of governmen system, the municipal government, health care providers, the housing authority, and the school system will promote



Daryl E. Chubin
03/14/97 05:15:10 PM

Record Type: Record

To: Thomas_corwin @ ed.gov @ inet, jsunley @ nsf.gov @ inet

cc: William R. Kincaid/OPD/EOP
Subject: revised draft framework

Dear Tom and Judy:

Below is a revised draft framework that is intended to reflect today's discussion and agreement. Please check it, edit as needed, and continue to improve it. Feel free to share it in whatever form with your colleagues.

Thanks, Daryl

P.S. Bill hasn't seen this version due to his schedule, but I compared his notes and mine in preparing the redraft.

***

Chubin-Kincaid Redraft 3/14/97 pm

Working Group on
IMPROVING MATH AND SCIENCE EDUCATION

A *Draft* Framework

In the Directive to the Secretary of Education and the Director of the National Science Foundation issued 6 March 1997, the President stated the need for an "action strategy" that supports "a voluntary national test for individual eight-grade students based on widely accepted, challenging national standards in mathematics. . . . We must ensure that Federal programs, research, and human resources are used as effectively as possible to help improve teaching and learning."

While the Directive states that the Secretary of Education has been tasked to develop the national math exam – based on a framework that is standards-based, reflecting content and benchmarks encompassed by NCTM, TIMSS, and NAEP – the interagency working group is to develop the action strategy. This strategy is explicitly linked to preparing students for the exam to be administered beginning in Spring 1999. The strategy must include recommended actions "involving the mathematics, scientific, and technical communities in support of these efforts."

In developing a strategy, the interagency group needs to identify which components of

standards-based education should be the focus of efforts to prepare students for world-class achievement in mathematics as assessed in the eighth grade. The following draft framework should be revised as the work of the group progresses:

1. **Improve teachers**: The focus must include both the preparation and certification of new teachers – their content knowledge, readiness to provide standards-based instruction, facility with technology as a learning tool – and the professional development of veteran teachers in need of training, support, and assistance to change their classroom practices. How can models of preservice and inservice training that help teachers embrace high standards be recognized and candidates for emulation? How have NSF and Department of Education programs in systemic reform and teacher enhancement contributed to this retraining? What other agency programs could be used for this purpose? In addition, how can we best disseminate information on significant research findings, such as TIMSS, and help teachers teach with confidence and understanding?

2. **Upgrade access to and implementation of curriculum and instructional materials**: The implementation of curricula is a State and district process that should be informed by the strengths and weaknesses of the choices. Similarly, there are many ways to teach standards-based content in math and science. Some ways are known to inspire and spur achievement, others to lower expectations and stifle both interest and proficiency. How can curricula that have demonstrated promise of lifting expectations and achievement be identified as preferred choices and made more accessible to teachers? How can assessment tools reinforce the better choices – sometimes in the face of local control – so that standards-based materials (texts, lessons, modules), which have been classroom-tested and accessible, are promoted?

3. **Integrate technology into the classroom**: Next to tests, textbooks drive the trajectory of teaching and learning. Technology expands the universe of materials (e.g, CD-ROMs, Internet) – only if the hardware is in place and teachers know how to use it. How can technology and materials be integrated to transform teaching and learning? Strategically, how can knowledge of available best practices and technology-based tools be spread by existing programs to support more teachers and classrooms?

4. **Motivate students and help them understand how math concepts are applied in the real world**: This component draws significantly on partnerships with organizations outside the Federal sector, but could also include agencies within the Federal government for which education is not their primary mission. They no doubt have people and other resources that could help enrich math and science instruction. It connects the notion of content standards in math and science – why they must be aspired to, how parents and communities can help children and schools achieve at world-class levels, how the media and business/industry can be enlisted in public service campaigns – with skills for the world of work and advanced learning. How can these resources be brought to bear nationally and locally to raise the visibility of the need? What novel arrangements would involve experts in math and science as well as volunteers, and make larger segments of the public attentive to the link between school and work?

Within this evolving framework, and for each of these components, the working group will

define a set of critical objectives and policy levers, Federal and otherwise, that the action strategy will be designed to address. To do so, the interagency group will review existing resources to determine what's working, identify gaps in knowledge, and sketch emerging or persistent issues that support the objectives to pursue after the 90-day report.

Rebecca Dittmar 03/07/97 08:12:56 AM

Record Type: Record

To: Timothy L. Newell/OSTP/EOP, Lisa M. Duffey/OSTP/EOP, Daryl E. Chubin/OSTP/EOP, Clifford J. Gabriel/OSTP/EOP

cc:
Subject: STATEMENT RE: MATH STANDARDS

...thought you might be interested....
---------- Forwarded by Rebecca Dittmar/OSTP/EOP on 03/07/97 08:10 AM ----------

STOTT_D @ a1.eop.gov
03/06/97 05:40:29 PM

Record Type: Record

To: See the distribution list at the bottom of this message

cc:
Subject: STATEMENT RE: MATH STANDARDS

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release March 6, 1997

March 6, 1997

MEMORANDUM FOR THE SECRETARY OF EDUCATION
THE DIRECTOR OF THE NATIONAL SCIENCE FOUNDATION

SUBJECT: Preparing Students to Meet National Standards
of Excellence in Eighth Grade Math and
Improving Math and Science Education

Since the early 1980s, U.S. elementary and secondary school students have begun taking tougher courses, and we are starting to see the results. National Assessment of Educational Progress scores have improved in math and science, with gains in mathematics equal to at least one grade level. On the Scholastic Aptitude Test (SAT), average math scores are at their highest in 25 years, even as the number and diversity of test-takers have increased. However, the eighth-grade results of the 41-Nation Third International Math and Science Study (TIMSS), released last fall, show that the United States is below average in math and just above average in science. That isn't acceptable; in this technology-rich information era, our students need to perform much better in both subjects, but especially in math, if they are to excel at higher-level math and science courses that are critical to college admission and success and to citizenship, productive employment, and lifelong learning.

The first step in raising achievement is lifting expectations and setting high standards for what students should know and be able to do. Our National Assessment of Educational Progress, TIMSS, and the standards developed by the National Council of Teachers of Mathematics give us a solid framework to build on. Last month, to help parents and teachers learn who needs help, what changes in teaching to make, and which schools need to improve, I asked the Secretary of Education to develop a voluntary national test for individual eighth-grade students based on widely accepted, challenging national standards in mathematics. The national test will be available to States and local school districts to give to their students in the spring of 1999, and will measure whether students have reached a high level of mathematics proficiency.

The primary responsibility for achieving high standards rests with students, teachers, parents, and schools in local communities across America. However, it is imperative that we work to ensure that Federal resources support student success as well. We must ensure that Federal programs, research, and human resources are used as effectively as possible to help improve teaching and learning.

more

(OVER)

Therefore, I direct the Secretary of Education and the Director of the National Science Foundation to form an interagency working group and to develop an action strategy for using

Federal resources to assist States and local school systems to prepare students to meet challenging math standards in eighth grade, and for involving the mathematics, scientific, and technical communities in support of these efforts.

The action strategy should include recommendations for the use of Federal resources to help States, local school districts, and schools to improve teaching, upgrade curriculum, and integrate technology and high-quality instructional materials into the classroom, as well as motivate students and help them understand how math concepts are applied in the real world. The strategy should identify significant Federal programs, activities, and partnerships available to improve teaching and learning, ensure that these resources are appropriately focused on helping students reach challenging math standards, and determine how these resources can best support State and local reforms. In developing this strategy, the interagency group should review the current status of improvements in math education and identify and address critical areas of need, drawing on research and input from educators and professional organizations.

Because teaching and learning in math and science are so integrally related, and because success in both subjects is vitally important in this information era, the working group should also review how Federal resources and partnerships with other organizations can help improve student achievement in science.

The working group should make its recommendations and submit its action strategy to me within 90 days.

WILLIAM J. CLINTON

# # #

Message Sent To: _____

Daryl E. Chubin
03/07/97 11:22:47 AM

Record Type: Record

To: William R. Kincaid/OPD/EOP

cc:
Subject: draft

Bill: Please review and mark. I'll revise and reproduce for distribution. Thanks, Daryl

HOW THE ACTION STRATEGY WILL HELP IMPROVE
MATH AND SCIENCE EDUCATION

Possible

~~Suggested~~ Areas for Working Group Attention

March 7, 1997

From the Directive:
[missing]
"In developing this strategy, the interagency group should **review the current status of improvements in math education** and **identify and address critical areas of need**, drawing on research and input from educators and professional organizations.

". . . the working group should also review how Federal resources and partnerships with other organizations can help improve student achievement in **science.**

"The action strategy should **include recommendations for the use of Federal resources to help** States, local school districts, and schools to improve . . ." (emphasis added)

- teaching
- curriculum
- instructional materials
- technology
- students' understanding of how math concepts are applied in the real world

Other Possible Areas to Consider (illustrative only):

- preparation and certification of new teachers) — under [illegible]

- media/public service campaign
- partnerships for technical assistance (e.g., tutors, resource persons)
- knowledge base on best practices
- lessons from systemic reform

HOW THE ACTION STRATEGY WILL HELP IMPROVE MATH AND SCIENCE EDUCATION:

Examples of actions by the inter-agency working group that will benefit . . .

Teachers:

- Identify and make available on-line instructional materials and assessment tools that are both based on math or science standards and classroom-tested.

- Create through partnerships with federal laboratories, colleges and universities, and community organizations a registry of resource persons with whom teachers can consult for assistance with particular lessons or topics.

- Develop strategies through teacher preparation, certification, and professional development that enable teachers to plan and take an active role in what to teach, how to teach and assess, and how to help students to learn.

Parents and communities:

- Inventory and disseminate the results of federally-sponsored research on instructional practices, materials, and tools that support rigorous math and science teaching and learning.

- Develop public service campaigns, with the assistance of state and local education and media organizations, that help all citizens understand the purpose of the national standards and tests, interpret results, and relate teaching, learning, and testing to local school initiatives intended to improve student achievement.

Students:

- Design ways that new community schools programs for enriching classroom learning through after-school, weekend, and summer programs include hands-on, inquiry-based experiences in math and science.

Higher Education, non-profit organizations, and the private sector:

- Explore the America Reads program as a model for a similar math program that enlists undergraduate students as work-study tutors in algebra and geometry.

- Examine the feasibility of adapting existing partnerships – across sectors and agencies -- to assist students in making connections among high expectations, high achievement in math and science, and real-world applications of knowledge and skills.

DRAFT -- March 4, 1997

THE ACTION STRATEGY DEVELOPED BY THE INTER-AGENCY WORKING GROUP WILL HELP IMPROVE MATH AND SCIENCE EDUCATION IN SIGNIFICANT WAYS

Here are some examples of the important areas in which the working group may offer recommendations:

- Supporting state and local, sytem-wide school improvement efforts geared to challenging academic standards.
- Disseminating recent research findings on practices that improve math and science education, such as the Third International Math and Science Study (TIMSS).
- Upgrading teacher preparation, certification, and professional development to help teachers teach to high standards.
- Identifying and developing challenging curricula, materials and textbooks.
- Improving access by teachers to high-quality math and science instructional units on-line.
- Assisting parents to understand and get involved with their children's education.
- Helping local schools reach out to professionals with strong math and science backgrounds to involve them in assisting students to learn and make connections between coursework and real-world applications.
- Broadening and strengthening after-school, weekend, and summer enrichment activities.

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Examples of actions by the inter-agency working group that will benefit . . .

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Improving Math Achievement by the Nation's Eighth Graders:
Scope of DPC-OSTP Core Working Group Activities

Through a Presidential Directive to DPC and OSTP, an inter-agency working group will be established. It will be co-chaired by NSF and DoEd. The DPC and OSTP representatives, together with the co-chairs, will form a core group for advancing standards and mathematics achievement. The urgency of this issue, as articulated in the State of the Union and the President's addresses in northern Illinois and Annapolis, suggests prompt agreement on key tasks of the working group. Presented below are questions to help define the scope of the group's effort.

The President's focus on a national eighth grade mathematics exam is a way of mobilizing the resources of local communities to help schools and districts to identify the conditions and practices that improve academic achievement in all subjects. The Presidential Directive (PRD) asks that the working group review the knowledge base, increase awareness of best practices, determine how to share and adapt what works, indicate the need for new initiatives, and suggest how the components of standards-based classrooms can be integrated to sustain high performance system-wide in mathematics and science by all students.

The core group must devise ways of drawing on research and programs of federal agencies that support teaching and learning based on rigorous standards of content and performance. This will require appropriate agency participation and the collaboration of many organizations outside the federal government – state and local education authorities, higher education representatives, business and industry, community-based organizations, and professional associations among others. How to tap these expert stakeholders to inform an inventory of support for improving math achievement is the challenge to the core group.

To proceed in a coherent and purposeful way, the following questions of scope are posed:

- Should the core group assemble separate task groups as needed to address each facet of the PRD? What should be the balance among fact-finding, accountability, and reporting?

- What are the preferences for how the inventory and its translation into recommendations should be conducted? Should agencies be invited to join formally the discussion of certain tasks on an as-needed basis – or be approached informally?

- Since DoEd is adapting TIMSS as the national math exam (and has initiated a process for meeting the spring 1999 deadline), it is assumed that the core group will be regularly updated on progress in design, pre-testing, and administration. What special support can the core group provide DoEd and in what form(s)?

- If the core group's focus is on the environment for helping schools and districts improve student achievement in math, how inclusive should the inventory be? Should all components of quality teaching and learning in math and science – reviewing the knowledge base, identifying best practices, increasing awareness of those practices and materials, supporting current teachers and preparing new ones, integrating technology, etc. – be included, or an agenda more narrowly circumscribed?

- Should the group suggest ways of using the volunteer districts in 1997-98 as testbeds for learning how community resources can be organized and focused to improve student achievement (as measured at the individual level in 1999)?

- Should the group address ways that schools falling short of excellence on the national math test can be connected with the appropriate resources for improving performance?

- The core group, on behalf of the EOP, can be vigilantly attentive to the rhetoric of a national math exam as a measure of progress toward international standards so that students, parents, and teachers can aspire together to improved performance. Should the PRD be used as a bully pulpit with a variety of communities, or as a less visible support organization?

- Should tasks be put in priority order now as a plan of work that indicates steps to be taken that encourage the application of standards to achievement? Should measures of school and district aspiration to and sustenance of high performance in math and science by all students be developed as part of the PRD, or deferred as a recommendation for later consideration?

- Should policy mechanisms for implementing the recommendations, e.g. Executive Orders, be discussed a priori or deferred?

Material for Redrafting the Presidential Directive on Improving Math Achievement

SOURCE: GOALS AND OBJECTIVES FOR OSTP/SCIENCE DIVISION, 2/28/97

Develop an inventory and recommendations regarding practices and materials that support 8th grade math standards and achievement by all students.

SOURCE: SCIENCE ADVISOR'S SPEECH TO THE NATIONAL ACADEMY OF SCIENCES' GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE, 2/26/97

You may wonder why I dwell on K-12 education. It is because our nation's colleges and universities have a key role to play in improving the performance of our students in math and science. The President's call for a voluntary national eighth grade mathematics exam is a way of mobilizing the resources of local communities to help schools and districts to identify the conditions and practices that improve academic achievement in all subjects. What better resource for improving science and math literacy and influencing careers than institutions of higher education? In various ways, faculty can help fortify teaching and learning in the K-12 classroom that is based on rigorous content standards such as those developed for science through the efforts of NAS. Combined with high expectations for all students and internationally-benchmarked performance, standards-based instruction can become the norm in U.S. classrooms. Universities, business, and industry all gain through the superior preparation of their students and workers.

Specifically, colleges and universities can help all students advance toward excellence in at least three ways. First, how we teach our future teachers is of paramount importance. We need a stronger partnership between colleges of education and colleges of science and engineering. Future teachers cannot build on students' natural curiosity about the physical world without first awakening their own, asking questions and developing an appreciation for experimentation, systematic observation, probability, and the making of inferences. Such "literacy" in the methods of inquiry as well as textbook answers is a prerequisite for teaching about a dynamic world. If teachers are not equipped – in content areas, in technology, and in hands-on, inquiry-based pedagogy – their students (and our next generation workforce) will suffer. New teachers lacking preparation in standards-based instruction will also add to the costs of local professional development. . . . Why add to the burden of retooling and retraining a veteran teacher workforce? These questions of investment in human resources are best addressed during study toward the baccalaureate. Colleges and universities can exercise quality control over what new teachers are trained to know and do.

Second, higher education is best positioned to increase the knowledge base on "what works" through research and evaluation of models and practices, and to suggest how standards-based classrooms can better utilize technology and sustain high performance in mathematics and science by all students. Through NSF's Systemic Initiatives and the DoEd's Goals 2000 program, states and districts are now changing management structures and teaching modes to raise academic performance. We must learn from these experiments in real time. Colleges and universities must be reliable partners of school districts and their teachers, as many companies have been, if the latest research in science and technology is to be adapted to the K-12 classroom. Higher education faculty are human resources for schools and communities. Tapping – electronically or otherwise – the diversity of disciplines and cultures among them puts a human face on science. It also increases the potential for mentoring students, as industry programs have long demonstrated.

Third, higher education is often the sector for drawing on talent in the national interest. The President has enlisted volunteers from over 60 colleges and universities to serve as tutors in the "America Reads" program. To help all students perform to world-class standards in mathematics, a pool of algebra and geometry tutors could likewise volunteer in schools and community-based organizations, after school and on weekends, to augment classroom instruction and enrich mathematics teaching and learning by the eighth grade. Such an initiative, which higher education could organize and run in collaboration with industry, is citizenship in the purest sense of sharing knowledge and expanding options. We know such interactions during the impressionable middle-schools years can make a big difference. I ask for your commitment to do more in partnership with K-12 schools and students nation-wide.

UNITED STATES DEPARTMENT OF EDUCATION

OFFICE OF THE UNDER SECRETARY

600 Independence Ave, SW
Suite 5164
Washington, D.C. 20202-8100

Telephone: (202) 401-3389 **Fax No: (202) 401-4353**

Fax Sheet Cover

TO: Bruce Lincoln

FAX: _____

FROM: Jerry Wurtz

NUMBER OF PAGES TO FOLLOW, INCLUDING COVER SHEET 2

IF YOU DID NOT RECEIVE THE COMPLETE TRANSMISSION, PLEASE CALL (202) 401-3389).

MESSAGE:

Examples of what may result from directive

* NSF and other agencies coordinate to make available to schools high quality cirriculum designed to help middle school students to master the basics of math, including algebra and even some geometry, by the end of 8th grade.

* To help teachers learn how to teach challenging math in an engaging, hands-on fashion, support a focus on content knowledge and the development of new textbooks and teaching techniques in our schools of teacher education.

* On-going professional development of math teachers will be strengthened through the use of videos showing how our teachers teach compared to those in high-achieving nations such as Japan.

March 3, 1997 DRAFT

MEMORANDUM FOR THE:
ASSISTANT TO THE PRESIDENT FOR DOMESTIC POLICY
ASSISTANT TO THE PRESIDENT AND DIRECTOR OF THE OFFICE
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: Improving Math and Science Education and Preparing Students to Meet Eighth Grade Math Standards

Since the early 1980's, U.S. elementary and secondary school students have begun taking tougher courses, and we are starting to see the results. National Assessment of Educational Progress scores have improved in math and science, with gains in mathematics equal to at least one grade level. On the SAT, average math scores are at their highest in 25 years, even as the number and diversity of test-takers have increased. However, the eighth-grade results of the 41-Nation Third International Math and Science Study (TIMSS), released this fall, show that the U.S. is just slightly above average in science and below average in math. That isn't acceptable; in this information era, our students need to perform much better in order to succeed economically.

Last month, to help parents and teachers learn who needs help, what changes in teaching to make, and which schools need to improve, I directed the Secretary of Education to develop a voluntary national test for ~~individual~~ eighth-grade students based on ~~challenging~~ standards in mathematics. This test will be ~~available~~ to states and local school districts to give to their students in the spring of 1999, and will measure whether students have reached the level of mathematics proficiency necessary to enable them to move forward and excel at the higher level math and science courses that are the gateway to college.

In addition to establishing the national test, we need to make sure that we are doing all we can to help improve teaching and learning in math and science. Therefore, I direct you to create an inter-agency group, under the leadership of the U.S. Department of Education and the National Science Foundation, that will be charged with preparing an action plan for raising student achievement in math and science and for preparing students to succeed on the 8th grade math test in 1999.

In developing this action plan, the working group should review the current status of improvements in math and science education, including standards, assessments, teaching, and curriculum, and identify and address critical areas of need. The plan should draw on existing research, as well as input from math and science educators and professional organizations. It should contain recommendations for the effective use of federal resources, as well as for gaining the active support and involvement of state and local government, higher education, the private sector and

voluntary organizations, in order to boost math and science achievement. The working group should submit its action plan to me within 90 days.

WILLIAM J. CLINTON

Interagency Group

- develop ~~federal~~ government wide strategy for using all fed resources available to support improved teaching in math and to help ~~help~~ students reach

gov't wide strategy to ~~assist schools~~ help prepare students to meet standards by assisting schools, local school systems, and [illegible]

- improve teaching
- improve curriculum
- use technology and [illegible] material
- motivate students [illegible] show how math concepts are used in real world

- identify all res. available to support improved teaching and learning in math
- ensure appropriately focused on objectives of [illegible]
- determine how fed govt can best support [illegible]

Improving Elementary and Secondary Science and Mathematics Education (Draft)

Background

On November 20, the eighth-grade results on the Third International Math and Science Study (TIMSS) were released. The report indicates that the U.S. remains far from the lead in math and science student achievement. In math, students score below the international average of the 41 TIMSS countries; in science, U.S. students score above the international average, but well below the leading nations. Strengths and weaknesses vary across subject areas. Overall, the U.S. claims just 5% of the top 10% of all math students in TIMSS countries, but 13% of the top 10% of science students.

TIMSS supplements data on student achievement with important findings on curriculum, instruction, and the lives of teachers and students. In the main, the findings confirm what previous research had already shown: in mathematics, the content taught in U.S. eighth-grade classes is less challenging than in other countries. topic coverage is not as focused, and classes require less high-level mathematical thought. Indeed, many U.S. math teachers report familiarity with reform recommendations, but only a few apply key points in their classrooms. In science, on the other hand, the degree of topic focus in the U.S. is more similar to other countries. Relative to Germany and Japan, two other countries studied in-depth under TIMSS, U.S. teachers have more college education than many of their international counterparts, but receive less practical training and less daily support.

The eighth-grade results of TIMSS have directed significant national attention to the need for dramatically upgrading U.S. math and science education. Release of additional grade-level findings over the next several months are likely to maintain a strong focus in this area. The time is right for increased federal leadership to take on this challenge.

Some possible elements of a coordinated response:

I. Creation of a High-Level Working Group

Lead agencies: National Science Foundation, Department of Education

Other core agencies (agencies with significant K-12 math and science activities focused on public education): Energy, NASA, HHS

Other agencies to involve: Defense, Commerce, Agriculture, Interior, EPA, Smithsonian

Oversight: OSTP, OMB

DRAFT

[Issue: The working group would involve the same agencies that are members of the National Science and Technology Council/Committee on Education and Training. One option would be to use the existing Committee, but to give it a new charter focusing broadly on K-12 education rather than narrowly on R&D and technology. If, instead, we decide to form a new working group, then it may be time to terminate the NSTC/CET, rather than creating a duplicative structure.]

II. Charge to the Working Group

Develop, within 180 days, an integrated plan that: (1) responds to the TIMSS findings; and (2) brings together the programs and resources of all relevant Federal agencies in support of a strategy for improving K-12 math and science education, within the broader context of standards-based reform, so that American students will receive a world-class education.

III. Specific Areas of Emphasis

Systemic Education Reform -- Review current experience with NSF's systemic initiatives, Goals 2000, Title I, and related programs to determine how Federal programs can best support State and local efforts to reform K-12 math and science education around challenging standards and assessments. Review existing standards (NCTM and NAS) and assessments against TIMSS findings to assess whether they are of world-class quality if properly implemented.

Teacher Preparation, Certification, and Enhancement -- Review the status of teacher **preservice education** in math and science (including issues like: (1) Are teacher ed programs becoming aligned with the NCTM and NAS standards?, (2) Are students preparing to become elementary educators receiving high-quality instruction in science and math content and in how to teach those subjects?, and (3) Do community colleges, where many future teachers begin their preservice education, provide an acceptable level of preservice math and science education?). Review current Federal programs that address improvement of the curriculum and instructional approaches.

Review State **certification** policies in the area of math and science, and the impact of the NSF State Systemic Initiatives on those policies. Explore whether States are establishing **recertification** requirements to ensure that experienced teachers keep up with advances in math and science content and pedagogy. Determine whether teachers are applying for National Board for Professional Teacher Certification in math and science and whether the availability of NBPTS certification is creating positive incentives in the teaching profession.

Review the range of Federal **teacher enhancement** programs -- including Eisenhower, and NSF, Energy, and NASA programs -- for evidence of effectiveness and to determine if the

current scope of activity is enabling a sufficient number of teachers to obtain the sustained, career-long professional development they need.

Curriculum and Materials -- Take a scan of the state of the K-12 curriculum (particularly textbooks) and materials, and determine whether they are challenging and up to date. (For instance, are curriculum reforms like "2061" and the "Scope, Sequence, and Content" project taking root?) Review the impact of Federal intervention in this area, including support for the development of State curriculum frameworks and funding of the major association-based efforts.

Student Activities -- Review current Federal activities that provide K-12 students with direct exposure to science -- e.g., NSF summer programs, activities that bring students into Federal research labs -- to determine their scope and effectiveness and the potential for replication of those activities at additional sites.

Public Engagement -- Develop a strategy for drawing sustained public attention to the needs and challenges in math and science education and eliciting greater public support for reform efforts.

IV. The Plan

Based on its review, the Working Group should develop a plan of action, for possible presentation to the President, covering all of the above activities, that marshals Federal resources:

-- In the remainder of FY 1997 (depending on what resources remain available);

-- In FY 1998 (the budget may assign some level of support to this activity -- perhaps a "plug," with details submitted to Congress following the planning period); and

-- In the out-years.

V. Follow-Up

Over the next 18 months - 2 years, the Working Group would be responsible for monitoring progress in carrying out the plan, modifying the plan as necessary in light of additional research or experience, and informing the President of key findings and developments.

Possible Activities of a DPC-OSTP Inter-agency Working Group on Improving Math and Science Achievement

Topical Areas

Inventory research and evaluation studies of:

Standards-based reform – What is the status of NSF Systemic Initiatives, DoEd's Goals 2000 and Title I, and related private efforts to introduce math and science content and performance standards throughout K-12? How do assessments in use compare with TIMSS and other standards-based tests?

Teacher preparation and certification – Are new teachers prepared through their undergraduate study to teach NCTM and NAS-based content? Are they skilled in educational technology? Does state certification require such preparation? How might Federal programs infuse preservice education?

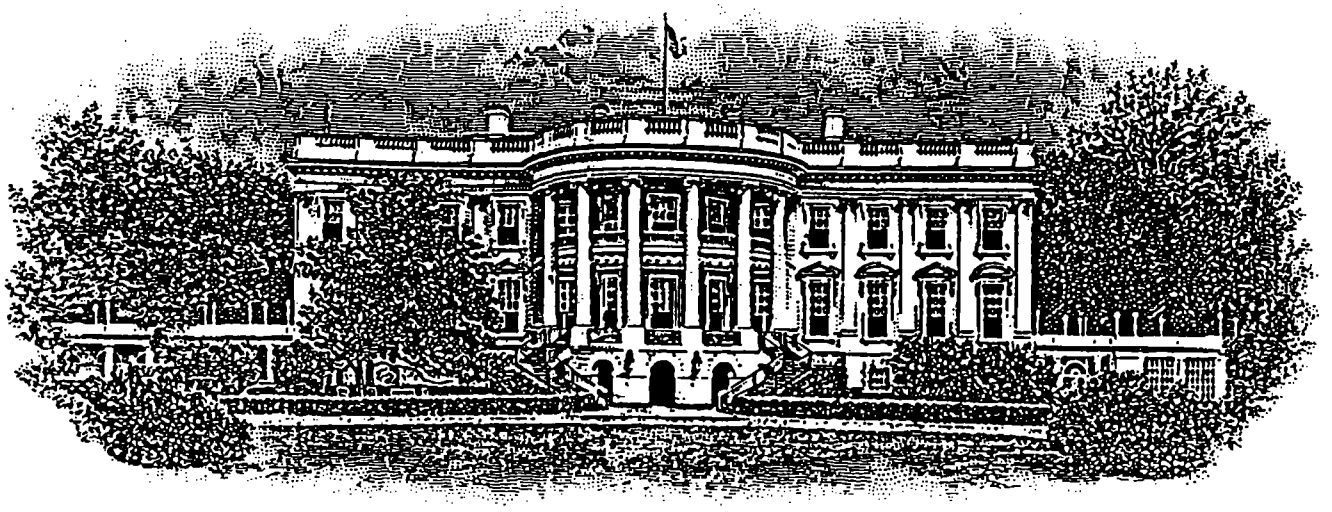
Teacher enhancement – Through DoEd Eisenhower, NSF, Energy, and NASA, numerous TE programs offer retooling of veteran teachers. From inter-agency reviews, what do we know about the effectiveness of these programs?

Curriculum and materials, incl. technology – What new materials are being developed, in what form, at what cost – and how has the "textbook adoption" process changed to accommodate the need for standards-based materials? What role does CCSSO, district-wide, and school-based management in this adoption process?

Student enrichment activities – After-school, weekend, and summer programs – often based in museums, science centers, and other community organizations – can have a significant influence on spurring student interest and augmenting student skills in math, science, and technology. What role do the DOD, DOE, and NASA labs play relative to NSF, DoEd, and Smithsonian programs? What is known about impacts of such enrichment experiences?

Public engagement – Enlisting the participation and support of parents, families, and communities in raising student achievement suggests a role for higher education, business and industry, community organizations, nonprofit foundations and think tanks. How can these resources be brought to bear?

The White House



DOMESTIC POLICY

FACSIMILE TRANSMISSION COVER SHEET

TO: Judy Wurtzel

FAX NUMBER: 401-4353

TELEPHONE NUMBER: 401-3281

FROM: Bill Kincaid

TELEPHONE NUMBER: Direct: 456-2857
Message: 456-2516

PAGES (INCLUDING COVER): 3

COMMENTS: As discussed.

Bill

Author: Mike Smith at WDCT01
Date: 1/31/97 6:41 PM
Priority: Normal
TO: William Kincaid
Subject: Re: TIMSS follow-up

---------- Message Contents ----------

Mike--

When ED hosts the interagency meeting with NSF, et all following up on last night's meeting, should I assume that the kick-off should be of senior type folks (you, Lane and Luther, Bruce Reed or Mike C., Gibbons or sombody from OSTP, etc.) or should it be staff level. Please let me know so I can get something to Vicky to begin pulling it together.Good question -- I think staff level inititially to put together an agenda and basic ideas. M

Thanks.

-- Bill

Author: "Henry_C._Kelly"@oa.eop.gov at Internet
Date: 1/29/97 3:29 PM
Priority: Normal
TO: William Kincaid at WDCT01
Subject: still trying to find Cohen. Here's a tenative draft [quick r
---------- Message Contents ----------

Message Creation Date was at 29-JAN-1997 15:29:00

Proposal:

Form two interagency working groups (IWGs). Ideally, each would be launched by a PRD. The groups would be focused on a specific mission and deliverable and formed from 2-4 key agencies. NSF and DoED would be primary in both. The groups would be as follows:

(1) Develop an integrated plan for responding to the challenge presented by the Third International Math and Science Study findings within 180 days. This plan would include recommendations for programmatic actions that can be taken immediately through executive order and a framework for actions that require funding proposals for the FY99 budget. The review would include options for:
ú improving teacher preparation, certification, and professional development.
ú improving curriculum and materials developed around new standards in math and science.
ú using learning technologies to support improved curricula
ú exposing students to working scientists through summer programs and other activities.
ú sustaining public support for reform efforts.

trade enhancement

The project would review programs in NSF and DoED that already support these objectives with special attention paid to NSF ,s systematic reform initiatives and Title I of Goals 2000. Other agency programs will be reviewed as appropriate. Title II; Higher Education

focus on bigger # program

?

The IWG will provide a decision memorandum at the end of the 180 day period that specifies actions possible through executive orders, new budget proposals, and possibly legislative proposals.

NSF and DoED will cochair the IWG

2) Develop an integrated plan for federal procurement and R&D in support of learning technology [attached PRD draft]. This will be responsive to recommendations that will be made in the forthcoming PCAST report. A separate IWG will be established with a 180 day timetable to develop a decision document that will propose principle agency missions and responsibilities, budget guidance for FY99, and any needed executive orders affecting procurement or other relevant areas.

NSF and DoED will co-chair the IWG with NASA and DoD as principals.

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF SCIENCE & TECHNOLOGY POLICY

TECHNOLOGY DIVISION

To: Kincaid

From: Barbara Bernstein for Henry Kelly **Fax#:** 401-4353

Pages + cover: 4 **Date:** 1/29/97

Special Instructions:

Old Executive Office Building • Washington DC 20500 • Room 423

TELEPHONE 202 456•6046 FAX 202 456•6023

DRAFT

August __, 1996

PRESIDENTIAL REVIEW DIRECTIVE NSTC-x

TO THE VICE PRESIDENT
THE SECRETARY OF DEFENSE
THE SECRETARY OF COMMERCE
THE SECRETARY OF LABOR
THE SECRETARY OF TRANSPORTATION
THE SECRETARY OF EDUCATION
THE SECRETARY OF HEALTH AND HUMAN SERVICES
THE DIRECTOR OF THE OFFICE OF MANAGEMENT AND BUDGET
THE ASSISTANT TO THE PRESIDENT FOR NATIONAL SECURITY
THE ASSISTANT TO THE PRESIDENT FOR ECONOMIC POLICY
THE ASSISTANT TO THE PRESIDENT FOR DOMESTIC POLICY
THE ADMINISTRATOR OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
THE DIRECTOR OF THE NATIONAL SCIENCE FOUNDATION
THE DIRECTOR OF THE CENTRAL INTELLIGENCE AGENCY

SUBJECT: Learning Technology R&D Strategy Review

Introduction

Effective use of learning technology for education and training is crucial to U.S. economic success, to the efficiency of government operations, and to the readiness of U.S. military personnel. Research has shown that on average, tutored students score better than 98% of classroom students. Because it is so labor-intensive, individual tutoring is not possible in most education and training settings. New technologies, however, raise the possibility that experiences approximating that of individual tutoring can be made available at comparatively low cost. We are, however, only beginning to understand the potential of this technology. Putting it to effective use will require an investment in research in two areas: (i) developing new technology-based instructional methods and (ii) assessing the impact and effectiveness of the new approaches.

The Federal government has always played a leading role in advancing the state-of-the-art of learning technology with investments that have led to major gains in the efficiency and effectiveness of training for military and civilian personnel. This work, together with direct agency support of education research, has served as a catalyst for university research and dissemination to both public schools and the private sector. Responsibility for research and assessment in learning technology, however, is spread

widely throughout the Federal community and may not be adequately integrated with developments outside the Federal government.

Purpose

The purpose of this review is to develop clear policy defining the Federal role in research related to education and training technologies, establish priorities for Federal research and development, propose improved methods for coordinating Federally sponsored research, suggest improved policies for procurement of learning technologies, and methods to leverage Federal funds through stronger partnerships with universities, businesses, and state and local governments. The review should recommend methods which can advance both government and commercial business interests through Federal research and procurement policies which improve the quality and lower the cost of education and training materials in both Federal and non-Federal education and training markets.

Guidelines for the Review

The National Science and Technology Council (NSTC) will constitute and the Office of Science and Technology (OSTP) will chair an Interagency Working Group (IWG) to conduct this review. Participation will include those agencies listed as distribution on this directive. The chair may invite other agencies to participate as appropriate, and may delegate work to special working groups of the IWG. The IWG will also seek external advice from the President's Committee of Advisors on Science and Technology, and other representatives of industry, academia, the nonprofit sector, and state and local governments.

Scope of the Review

The IWG will propose a Learning Technology R&D Strategy that will include, but not be limited to, the following components:

1. Federal R&D Program Responsibilities. The IWG will develop a clear roadmap of R&D requirements in education and training technology from Federal agencies including the full range of learning technology applications associated with mission requirements (including, but not limited to, low-end microcomputer-based applications, complex simulation-based instruction, curriculum design, innovations in pedagogy required by the new technology, improved methods for evaluating student performance, and improved protocols for evaluating the value of using technology in learning). As a first step, the IWG will consolidate the current body of knowledge on the cost-effectiveness of learning technology and lead the scientific assessment and demonstration of new technologies. The IWG will also propose methods for coordinating and managing federal research so that federal funds will: (a) meet mission requirements and basic research needs efficiently; (b) ensure that

Federal research funds are being used only where private research investment or research induced by Federal procurement could not do the job more effectively; and (c) wherever possible, suggest methods to reengineer Federal procedures and practices to ensure efficient investment in learning technology.

2. Coordination with Non-Federal R&D Activities. The IWG will identify approaches that: a) encourage R&D in cognitive science and learning technology outside the Federal government; and b) to the extent practical, ensure that innovative learning technology developed under Federal support results in products and concepts that can support both Federal mission requirements and the needs of civilian education and training. Such approaches may include use of Federal procurement programs.

3. Plans of Action. The IWG will develop an action plan that identifies Federal R&D program objectives, responsible Federal departments and agencies, program milestones, and estimates of additional or redirected resources where and if they are needed to support these objectives. This plan will include descriptions of existing R&D programs from all Agencies and Departments that have direct contribution to the breakthrough R&D areas in this review. The IWG will also develop an action plan to coordinate Federal activities with non-Federal sectors.

Product

The IWG will make appropriate recommendations for national policy on the management of Federal learning technology R&D. Recommendations resulting from this review will be provided to the Assistant to the President for Science and Technology no later than November 30, 1996.

John H. Gibbons
Assistant to the President for
Science and Technology

Date

Improving Elementary and Secondary Science and Mathematics Education (Draft)

Background

On November 20, the eighth-grade results on the Third International Math and Science Study (TIMSS) were released. The report indicates that the U.S. remains far from the lead in math and science student achievement. In math, students score below the international average of the 41 TIMSS countries; in science, U.S. students score above the international average, but well below the leading nations. Strengths and weaknesses vary across subject areas. Overall, the U.S. claims just 5% of the top 10% of all math students in TIMSS countries, but 13% of the top 10% of science students.

TIMSS supplements data on student achievement with important findings on curriculum, instruction, and the lives of teachers and students. In the main, the findings confirm what previous research had already shown: in mathematics, the content taught in U.S. eighth-grade classes is less challenging than in other countries, topic coverage is not as focused, and classes require less high-level mathematical thought. Indeed, many U.S. math teachers report familiarity with reform recommendations, but only a few apply key points in their classrooms. In science, on the other hand, the degree of topic focus in the U.S. is more similar to other countries. Relative to Germany and Japan, two other countries studied in-depth under TIMSS, U.S. teachers have more college education than many of their international counterparts, but receive less practical training and less daily support.

The eighth-grade results of TIMSS have directed significant national attention to the need for dramatically upgrading U.S. math and science education. Release of additional grade-level findings over the next several months are likely to maintain a strong focus in this area. The time is right for increased federal leadership to take on this challenge.

Some possible elements of a coordinated response:

I. Creation of a High-Level Working Group

Lead agencies: National Science Foundation, Department of Education

Other core agencies (agencies with significant K-12 math and science activities focused on public education): Energy, NASA, HHS

Other agencies to involve: Defense, Commerce, Agriculture, Interior, EPA, Smithsonian

Oversight: OSTP, OMB

[Issue: The working group would involve the same agencies that are members of the National Science and Technology Council/Committee on Education and Training. One

option would be to use the existing Committee, but to give it a new charter focusing broadly on K-12 education rather than narrowly on R&D and technology. If, instead, we decide to form a new working group, then it may be time to terminate the NSTC/CET, rather than creating a duplicative structure.]

II. Charge to the Working Group

Develop, within 180 days, an integrated plan that: (1) responds to the TIMSS findings; and (2) brings together the programs and resources of all relevant Federal agencies in support of a strategy for improving K-12 math and science education, within the broader context of standards-based reform, so that American students will receive a world-class education.

III. Specific Areas of Emphasis

Systemic Education Reform -- Review current experience with NSF's systemic initiatives, Goals 2000, Title I, and related programs to determine how Federal programs can best support State and local efforts to reform K-12 math and science education around challenging standards and assessments. Review existing standards (NCTM and NAS) and assessments against TIMSS findings to assess whether they are of world-class quality if properly implemented.

Teacher Preparation, Certification, and Enhancement -- Review the status of teacher **preservice education** in math and science (including issues like: (1) Are teacher ed programs becoming aligned with the NCTM and NAS standards?, (2) Are students preparing to become elementary educators receiving high-quality instruction in science and math content and in how to teach those subjects?, and (3) Do community colleges, where many future teachers begin their preservice education, provide an acceptable level of preservice math and science education?). Review current Federal programs that address improvement of the curriculum and instructional approaches.

Review State **certification** policies in the area of math and science, and the impact of the NSF State Systemic Initiatives on those policies. Explore whether States are establishing **recertification** requirements to ensure that experienced teachers keep up with advances in math and science content and pedagogy. Determine whether teachers are applying for National Board for Professional Teacher Certification in math and science and whether the availability of NBPTS certification is creating positive incentives in the teaching profession.

Review the range of Federal **teacher enhancement** programs -- including Eisenhower, and NSF, Energy, and NASA programs -- for evidence of effectiveness and to determine if the current scope of activity is enabling a sufficient number of teachers to obtain the sustained, career-long professional development they need.

Curriculum and Materials -- Take a scan of the state of the K-12 curriculum (particularly textbooks) and materials, and determine whether they are challenging and up to date. (For instance, are curriculum reforms like "2061" and the "Scope, Sequence, and Content" project taking root?) Review the impact of Federal intervention in this area, including support for the development of State curriculum frameworks and funding of the major association-based efforts.

Student Activities -- Review current Federal activities that provide K-12 students with direct exposure to science -- e.g., NSF summer programs, activities that bring students into Federal research labs -- to determine their scope and effectiveness and the potential for replication of those activities at additional sites.

Public Engagement -- Develop a strategy for drawing sustained public attention to the needs and challenges in math and science education and eliciting greater public support for reform efforts.

IV. The Plan

Based on its review, the Working Group should develop a plan of action, for possible presentation to the President, covering all of the above activities, that marshals Federal resources:

-- In the remainder of FY 1997 (depending on what resources remain available);

-- In FY 1998 (the budget may assign some level of support to this activity -- perhaps a "plug," with details submitted to Congress following the planning period); and

-- In the out-years.

V. Follow-Up

Over the next 18 months - 2 years, the Working Group would be responsible for monitoring progress in carrying out the plan, modifying the plan as necessary in light of additional research or experience, and informing the President of key findings and developments.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

Bill K.

OFFICE OF THE DIRECTOR

MEMORANDUM

TO: John H. Gibbons, Director
Office of Science and Technology Policy

Marshall S. Smith, Acting Deputy Secretary
Department of Education

FROM: Neal Lane, Director
National Science Foundation

DATE: December 11, 1996

SUBJECT: NSTC Education Activities

The draft concept paper that Mike generated as follow-up to our meeting last month provides a good base from which to move forward. The focus on responding to the TIMSS findings is a good one that should stimulate interest in NSTC agencies, particularly those participating in CET and CFS.

In a recent report of the Council on Competitiveness, the Council identifies workplace skills as the key factor influencing the US competitive position in the future. Although US spending on education is very high in comparison to other countries and we graduate proportionately more students at every level, quality comparisons such as the TIMSS study lead the Council to cite the productivity of this investment as an area of vulnerability. The effort Mike envisions for responding to the TIMSS findings aims directly at improving the productivity of the US investment in science and math education. Thus, it is an important, high priority activity for NSTC.

My preference would be that CET's charge be broadened to include attention to issues of excellence in K-12 science and math education and that CET either serve as the working group envisioned in the concept paper or provide oversight for it. I like Mike's basic charge to the working group and the list of emphasis areas. I am appending a few comments on how the working group might proceed in developing the plan.

Attachment

Improving Elementary and Secondary Science and Mathematics Education
NSF Comments on the draft of November 22, 1996

1. The working group would be charged with developing a plan for response to the TIMSS findings over the next 6 months.

The focus of the plan would be on federal actions (both programmatic and use of influence) that could lead to improved performance on future international performance assessments. The plan would be in the context of standards-based education reform, consistent with the previous work of the CET/CFS joint subcommittee.

2. The draft describes several emphasis areas for the plan. For each of these, there is background information to be gathered in order to put a plan together. This reformulation is a bit different from the approach of the plan.

- *What are the federal agencies doing now that might have an impact? How effective is it? Are there lessons learned?* (The current joint CFS/CET subcommittee probably has much of this information to the extent it exists. There would not be time to do evaluations of existing programs, but the working group could draw on evaluations completed or in progress.)

- *What is the response to date with respect to adoption and implementation of standards?* (This would include discussion of how federal programs intersect with standards-based education reform. But it also requires going beyond what the federal sector is doing to determine what states and localities are already doing, how teacher training and materials development are incorporating standards, etc. Contacts with the National Governors Association may be appropriate here. The idea of reviewing the extant standards with an eye to seeing if they are of world-class quality if properly implemented is excellent.)

- *Drawing on the TIMSS analysis, what are the barriers to improved performance? To what extent are they amenable to a federal response, either programmatic action or use of influence?* (This could be the key to a truly effective plan.)

- *What are important areas where we still need additional background information?* (This will inform the evolution of federal action over time, as answers are developed.)

One area missing from the list of emphasis areas is the use of learning technologies. In most of these areas, there is currently only a minimal interagency set of activities. Part of the plan may be to understand how more agencies can be effectively involved in the standards-based reform effort.

3. This is a very ambitious set of issues to cover in 6 months. It is not clear that any action can be expected in FY97; even the FY98 appropriations may be too far along to make a significant change for FY98. But there could be a Presidential push in later years.

- Sys Ch Refm
- Teach Train (prep, cert.)
- Curricula
- Technology

January 29, 1997

Note to Mike

Attached are the following items for your meeting with OSTP and NSF:

- An e-mail from Henry Kelly that gives a rough outline of their thinking on the two working groups that they propose.
- A draft Presidential Review Directive for the R&D working group.
- Your original working group proposal that you shared with Gibbons and Lane.
- Lane's response memo.

In terms of OSTP's thinking, Kelly says that he has found "PRD's" to be an effective way to get things done, and is interested in using them for these working groups. The R&D directive looks fairly bureaucratic, just in terms of all the different organizations it ropes in. I don't believe there is a draft on the TIMSS response yet; however, Henry's e-mail looks to be heading in the right direction.

I have given copies of OSTP's material to Linda Roberts and Tom Corwin, and we will be discussing them tomorrow. We will also try to talk with NSF staff again to get a sense of their thinking.

I think there have been some phone calls back and forth between OSTP and DPC, but I don't know exactly where that stands. I wouldn't be surprised if Mike C. attends tomorrow.

In general, I think we should stick with your basic point of trying to make the TIMSS group as nimble and action-oriented as possible.

-- Bill

UNITED STATES DEPARTMENT OF EDUCATION

OFFICE OF THE UNDER SECRETARY

600 Independence Avenue, SW
FOB-10, Room 5164
Washington, DC 20202-8100

Telephone Number: (202) 205-0704
Alternate: (202) 401-3389

FAX Number: (202) 401-4353
Alternate FAX: (202) 401-3095

FAX COVER SHEET

TO: Neal Lane (306-1000)

FAX: 703-306-0109

FROM: **BILL KINCAID** (for Mike Smith)

THIS FAX INCLUDES THE COVER SHEET PLUS 4 PAGES.

IF YOU DID NOT RECEIVE THE COMPLETE FAX, PLEASE CALL (202) 205-0704.

MESSAGE:

As previously discussed, draft concept paper on inter-agency response to TIMSS.

Author: William Kincaid at WDCT01
Date: 1/21/97 8:56 AM
Priority: Normal
TO: Mike Smith
Subject: more on task force

---------- Message Contents ----------

Mike--

Can't remember if I relayed this to you on Friday. Mike Cohen spoke with Neal Lane Fri. p.m. He said he would be happy to go along with the task force. However, he said that he couldn't remember having seen the paper that you sent over....

Late Friday night I faxed over to Lane's office a copy of the "challenge" paper, as well as a document that we are preparing the summarizes various aspects of federal support for math and science education.

-- Bill

Author: William Kincaid at WDCT01
Date: 1/21/97 8:41 AM
Priority: Normal
TO: Mike Smith
Subject: math/science task force
---------- Message Contents ----------

Mike--

This weekend I spoke to Mike C. He thought that Bruce Reed would probably want to give DPC a signicant oversight role and not just have OSTP do it. He said he was going to try to reach you to discuss.

-- Bill

M E M O

TO: Mike

FROM: Bill

DATE: December 30, 1996

RE: TIMSS Interagency Response

Tomorrow (Tuesday) Tom Corwin and I will be meeting with you to discuss next steps on the inter-agency response to TIMSS. We will patch in Linda Roberts, who is on vacation but has strong feelings about the best ways for us to proceed in light of their (frustrating) experience with inter-agency efforts in technology. I have also invited Joy Belin to attend, to help her get up-to-speed on happenings with TIMSS generally.

Attached are two items:

- the proposal that you sent over to NSF and OSTP.
- the response that you received from Neal Lane.

Here are some the issues that need to be hashed out:

l) Organizational framework: In your paper you suggest that we could either give the existing NSTC/CET a new charter, or develop a new group to take this on. NSF has indicated that it believes CET should serve as the basic working group or provide oversight. Henry Kelly with OSTP thinks that CET has outlived its usefulness and we should develop a new working group with a specific charge and expected products. Likewise, Linda thinks we should not revive CET for this purpose. It isn't clear whether NSF's "preference" on this is strong. This organizational issue needs to be resolved quickly so we can move on.

2) Substantive focus: While the basic charge to the group looks pretty similar in both your paper and the NSF response, focusing on the federal response to TIMSS, NSF has proposed a smaller, and more generic set of questions for the working group to cover. At first blush, Tom and I felt that the two could be harmonized without too much trouble, but Linda feels that your proposed emphasis is stronger and makes more sense. In your paper you lay out several specific areas for the interagency group to explore. We need to focus in on how different are the ideas on the table and how strongly should we push for our version.

3) Staffing: We need to think about how our staffing of this slice of the TIMSS response fits in with our broader efforts at ED. Who should be leading our contacts with NSF, OSTP, and others on this piece day-to-day?

4) Next steps: Do you want to talk with Neal Lane about any of these issues yourself, or do you simply want us to hash them out at the staff level based on your guidance? And do we want to get something firmed up with NSF before engaging with OSTP much more (keeping in mind that Henry Kelly seems eager to meet on this soon).

-- Bill

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE DIRECTOR

Bill K.

MEMORANDUM

TO: John H. Gibbons, Director
Office of Science and Technology Policy

Marshall S. Smith, Acting Deputy Secretary
Department of Education

FROM: Neal Lane, Director
National Science Foundation

DATE: December 11, 1996

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TO MIKE SMITH

DATE 1/17 TIME 9:30AM

PHONE CALLS

"WHILE OUT" RECORD

M. ANGELA DIAZ

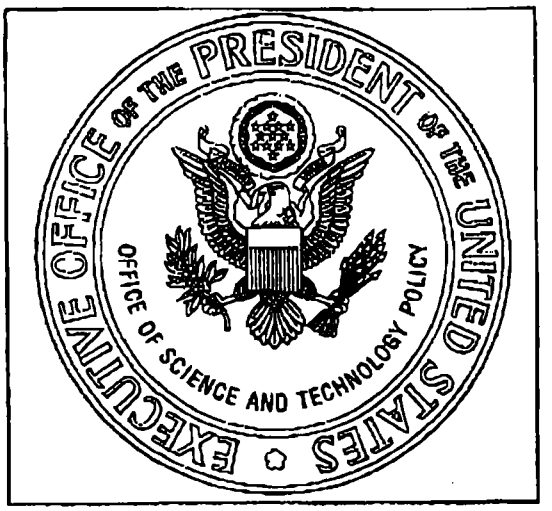
OF WHITE HOUSE

PHONE 456 - 6100
AREA CODE NUMBER EXTENSION

TELEPHONED	✓	PLEASE CALL	✓
CALLED TO SEE YOU		RETURNED CALL	
WILL CALL AGAIN		~~URGENT~~	

MESSAGE Dr. Gibbons
456-7116
2pm

TAKEN BY: JN



Jack Gibbons
Neil Lane

Mark Luker

NATIONAL SCIENCE AND TECHNOLOGY COUNCIL
EXECUTIVE OFFICE OF THE PRESIDENT
17th and Pennsylvania Avenue, N.W.
OEOB/Room 435
Washington, DC 20502

PHONE: 202-456-6100 FAX: 202-456-6026

TO: Vicky Stroud DATE: 1-17-97

FAX NUMBER: 401-3095

FROM: Angela Phillips Diaz

PAGES (including cover sheet): 5

COMMENTS: Per our discussion background for telecon with Mike Smith this p.m.

The C
Pls see me first
M

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE DIRECTOR

MEMORANDUM

TO: John H. Gibbons, Director
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3. This is a very ambitious set of issues to cover in 6 months. It is not clear that any action can be expected in FY97; even the FY98 appropriations may be too far along to make a significant change for FY98. But there could be a Presidential push in later years.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

12-11-96
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KELLY
Phillips

OFFICE OF THE DIRECTOR

MEMORANDUM

TO: John H. Gibbons, Director
Office of Science and Technology Policy

Marshall S. Smith, Acting Deputy Secretary
Department of Education

FROM: Neal Lane, Director
National Science Foundation

DATE: December 11, 1996

SUBJECT: NSTC Education Activities

The draft concept paper that Mike generated as follow-up to our meeting last month provides a good base from which to move forward. The focus on responding to the TIMSS findings is a good one that should stimulate interest in NSTC agencies, particularly those participating in CET and CFS.

In a recent report of the Council on Competitiveness, the Council identifies workplace skills as the key factor influencing the US competitive position in the future. Although US spending on education is very high in comparison to other countries and we graduate proportionately more students at every level, quality comparisons such as the TIMSS study lead the Council to cite the productivity of this investment as an area of vulnerability. The effort Mike envisions for responding to the TIMSS findings aims directly at improving the productivity of the US investment in science and math education. Thus, it is an important, high priority activity for NSTC.

My preference would be that CET's charge be broadened to include attention to issues of excellence in K-12 science and math education and that CET either serve as the working group envisioned in the concept paper or provide oversight for it. I like Mike's basic charge to the working group and the list of emphasis areas. I am appending a few comments on how the working group might proceed in developing the plan.

Attachment

Improving Elementary and Secondary Science and Mathematics Education
NSF Comments on the draft of November 22, 1996

1. The working group would be charged with developing a plan for response to the TIMSS findings over the next 6 months.

The focus of the plan would be on federal actions (both programmatic and use of influence) that could lead to improved performance on future international performance assessments. The plan would be in the context of standards-based education reform, consistent with the previous work of the CET/CFS joint subcommittee.

2. The draft describes several emphasis areas for the plan. For each of these, there is background information to be gathered in order to put a plan together. This reformulation is a bit different from the approach of the plan.

- *What are the federal agencies doing now that might have an impact? How effective is it? Are there lessons learned?* (The current joint CFS/CBT subcommittee probably has much of this information to the extent it exists. There would not be time to do evaluations of existing programs, but the working group could draw on evaluations completed or in progress.)

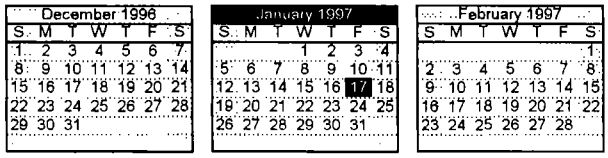
- *What is the response to date with respect to adoption and implementation of standards?* (This would include discussion of how federal programs intersect with standards-based education reform. But it also requires going beyond what the federal sector is doing to determine what states and localities are already doing, how teacher training and materials development are incorporating standards, etc. Contacts with the National Governors Association may be appropriate here. The idea of reviewing the extant standards with an eye to seeing if they are of world-class quality if properly implemented is excellent.)

- *Drawing on the TIMSS analysis, what are the barriers to improved performance? To what extent are they amenable to a federal response, either programmatic action or use of influence?* (This could be the key to a truly effective plan.)

- *What are important areas where we still need additional background information?* (This will inform the evolution of federal action over time, as answers are developed.)

One area missing from the list of emphasis areas is the use of learning technologies. In most of these areas, there is currently only a minimal interagency set of activities. Part of the plan may be to understand how more agencies can be effectively involved in the standards-based reform effort.

3. This is a very ambitious set of issues to cover in 6 months. It is not clear that any action can be expected in FY97; even the FY98 appropriations may be too far along to make a significant change for FY98. But there could be a Presidential push in later years.



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Calendar

Start	End	Category	Description
17 Jan 1997 9:00 AM	9:30 AM		Mtg. w/DianeR (Office) Patrick
10:00 AM	11:00 AM		Discuss 105th Cong./Public Ed Attacks/NSBAs Agenda w/Anne Bryant,Laurie Westley,TerryP,SusanF (Office)
2:00 PM	2:30 PM		Call to Dr. Gibbons and Angela Diaz 456-7116
3:00 PM	3:10 PM		Mtg. re GPAS Progress Review w/BillK (Office)
3:10 PM	3:20 PM		Mtg. re GPAS Progress Review w/DougF (Office)
3:20 PM	3:30 PM		Mtg. re GPAS Progress Review w/ShirleyS (Office)
3:30 PM	3:40 PM		Mtg. re GPAS Progress Review w/Jessica (Office)
3:50 PM	4:00 PM		Mtg. re GPAS Progress Review w/Michele (Office)
4:00 PM	4:10 PM		Mtg. re GPAS Progress Review w/Tanya (Office)
4:10 PM	4:20 PM		Mtg. re GPAS Progress Review w/KirkW (Office)
4:20 PM	4:30 PM		Mtg. re GPAS Progress Review w/Nat (Office)
4:30 PM	4:40 PM		Mtg. re GPAS Progress Review w/Steve (Office)

Changes to the Learning Technology PRD

1) The PRD, as it is currently written, focuses mainly on the interests and responsibilities of the Federal government in learning technologies. This should be changed to incorporate a review and evaluation of the use of educational technologies in the classroom. The IWG needs to focus on the current state of learning technologies and the next generation of technologies that will reach the nation's classrooms. (NSF)

2) Another area that needs to be included in the PRD is the role of teachers in implementing these new technologies. Teacher training and content development are critical to a comprehensive discussion of learning technology R&D. (DOT)

3) The IWG should be charged with presenting an integrated plan on learning technology R&D within 180 days. This plan should make concrete recommendations for FY 1999. (OMB)

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From: Judy Sunley <jsunley@nsf.gov>
Subject: meeting of ED/NSF working group

April 8 meeting -- we'll be in Rm 5342 in FOB 10 (600 Independence Avenue). We have the room from 3:00 until 5:00.

Agenda:

1. Objectives for the action strategy

2. Interactions with stakeholders

   - other agencies
   - April 7 meeting with math organizations
   - other stakeholders

3. Possible letter report from MSEB

See you at 3:00.

Judy Sunley

ED/NSF Working Group

SUGGESTED OBJECTIVES for DISCUSSION
4/8/97

PD

Increase the availability of sustained professional development for standards-based, inquiry-focused education that assists teachers in implementing research-proven strategies.

Ensure teachers have the content knowledge and pedagogical skills necessary to teach challenging mathematics ~~as called for by~~ a test at the end of eighth grade.
to challenging standards as measured by the

Identify, disseminate, and promote the adoption of instructional materials and exemplary strategies for professional development at all levels.

Engender an intense interaction between K-12 and high education focused on pre-service education and in-service professional development

Provide support to schools (districts, states) to help them make informed choices among high-quality curricula and materials.

Provide support to schools (and districts) to help them implement high-quality, standards-based materials.

Encourage public support and demand for high-quality, demanding curricula.

Educate the public on the importance of standards-based education and the character of appropriate materials and instructional strategies.

Educate the public on the importance of mathematical proficiency for future job and educational opportunities.

Promote a vigorous program of research, testbeds, and innovative implementation of technology in the classroom.

Disseminate effective practices in the implementation of technology in innovations in instruction, teacher professional development, and assessment.

Improve integration between systems providers and schools.

Promote federal/state/local/private sector partnerships. Enhance coherence of federal programs with one another.

Build wide-spread understanding by students, parents, teachers and general public of both the possibility and the necessity of mastering challenging mathematics as a gateway to college and careers. Change attitudes about math ability.

Engage professional, mathematical, scientific and technical communities in working with students and teachers to help make mathematics study exciting and concrete and to show the importance of mathematics to college opportunities and careers.